Taxes and Corporate Finance: A Review

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Abstract:

This paper reviews tax research related to domestic and multinational corporate financing decisions, leasing, pensions, debt maturity, start-ups, small firms, risk management, personal taxes, dividend policy, organizational form, compensation policy, and tax shelters. Updated information is provided about simulated corporate marginal tax rates, the relation between corporate tax rates and debt ratios, and the degree of conservatism in corporate debt policy. New results are reported about debt maturity policy, empirically interpreting the Miller (1977) equilibrium, and the importance of stock option compensation deductions. Option deductions are as large as interest deductions for many firms during 1996-1998.

Comments and suggestions welcome.

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Modigliani and Miller (1958, 1961) demonstrate that many corporate decisions are irrelevant in a perfect, frictionless world. During the past 45 years, much research has focused on whether introducing imperfections into the Modigliani and Miller (MM) framework makes certain corporate decisions relevant. Corporate and personal taxes are thought to introduce large imperfections, and therefore to play an important role in corporate decision-making. The purpose of this paper is to review research that investigates the role that taxes play in corporate finance. 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 (2001)).

Table 1 outlines various avenues of research that investigate how taxes might affect corporate decisions. Taxes affect capital structure decisions, including the choice of debt, equity, leasing, and other financing instruments. Taxes play a role in corporate risk management, dividend, and share repurchase policies. Research shows that taxes affect the form and timing of compensation and pension policies. Taxes affect the choice of organizational form (corporate versus partnership). Finally, the complexity and richness of the international tax code provides a variety of incentives that affect corporate decisions. Rather than summarizing the results here, the sections that follow provide a theoretical framework of how taxes might affect corporate decisions and then summarize the related empirical evidence. Suffice to say that taxes affect corporate decisions in a variety of different ways, though it is not clear whether taxes are always of first-order importance.

This paper has several objectives. The first is to bring the profession up-to-date on corporate tax research found in the finance, accounting, and public economics literatures. Taxes are either the main feature or an important secondary feature in much theoretical and empirical corporate finance research, and yet tax effects are often modeled in a crude or misleading manner. Taxes get blamed (or get credit) for a lot of things but these claims are not always investigated rigorously. I hope that a survey of current tax research will give the profession a common starting point for future work, and also move the profession beyond some largely resolved issues. For example, a number of papers written in the 1990s show that tax incentives affect capital

structure decisions, which helps resolve the "capital structure puzzle" (Myers (1984)). Given that the traditional trade-off theory is expressed in terms of balancing the tax benefits of debt with the costs, resolving the capital structure puzzle provides evidence in favor of the trade-off theory. And yet, most of the recent papers testing the trade-off theory fail to cite, or incorporate, these important tax findings. I think that it is important to review the status of research into the capital structure puzzle and other corporate tax issues.

A second objective of the paper is to help theoreticians think about whether and how taxes should be modeled. Avoiding corporate taxes is often assumed to be the primary benefit of debt. (Pick up any introductory finance textbook and you will find that taxes are one of the primary factors that are supposed to affect capital structure.) There are at least two reasons that modelers make this assumption. First, the magnitude of tax costs, and thus the potential benefit of avoiding taxes, is large, so it makes sense that taxes could affect corporate decisions. Over the past thirty years, the most profitable U.S. firms have been taxed at federal rates as high as 48% of profits, not to mention state and local taxes (see Figure 1). A second reason that modelers might assume that there is a tax advantage to debt is that tax factors are often easier to specify than are nontax factors such as agency costs or asymmetric information. For example, the tax advantage of debt is often modeled as a fixed constant such as $\tau_C = 0.48$, where τ_C is the corporate marginal tax rate. However, research summarized below indicates that τ_C is not constant across firms or through time but in fact is an endogenous variable that is affected by corporate decisions. Moreover, the assumption that taxes are a primary benefit of debt is rarely supported by citing empirical evidence. One of the goals of this paper is to summarize the existing evidence to shed light on whether it is reasonable to assume an important tax incentive or whether this is simply a convenient modeling choice.

A third objective is to provide guidance to empiricists about specifying tax effects. For example, a seminal article by DeAngelo and Masulis (1980) shows that firms can have different optimal debt ratios because the degree to which nondebt tax shields (NDTS) substitute for interest deductions varies across firms. To this day, some papers try to test or control for tax effects using NDTS as an explanatory variable. Empirically, however, NDTS are perhaps a better proxy for the income effect of profitability than they are

a measure of the substitution effect modeled by DeAngelo and Masulis. Moreover, the MacKie-Mason (1990) "fix" of interacting NDTS with the probability of bankruptcy to isolate substitution effects has been shown to be a low-power measure of tax effects. As another example, some papers still use the existence of net operating loss (NOL) carryforwards to indicate tax code convexity, even though recent research indicates this approach can be misleading. A goal of this paper is to describe a more appropriate framework for empirically specifying tax effects.

The fourth objective of this paper is to suggest areas for future research. For one thing, even though much recent research indicates that taxes are statistically significantly related to corporate decisions, we need to know more about whether these effects are of first- or second-order economic importance. For another thing, finance researchers are just now scratching the surface with respect to how personal taxes affect corporate decisions (e.g., Miller (1977)). We have not yet resolved this bit of the capital structure puzzle. Finally, there is very little evidence about how much tax benefits add to firm value. For example, Fama and French (1998) find that firm value and debt usage (dividends) are negatively (positively) correlated, contrary to the tax hypotheses. Determining whether and how much tax benefits affect firm value is an important area for future research in corporate finance.

A final objective is to report some new research. In the process of writing this paper, I updated the simulated tax rates described in Section 1. (They are available at http://www.duke.edu/~jgraham.) Capital structure regressions have also been updated, with the coefficients indicating that taxes exert a positive influence on debt ratios through 1999. I also estimate the personal tax penalty for interest income and argue that Miller's (1977) equilibrium could hold at the margin – but that there is still a puzzle as to why some profitable, high-tax firms appear underlevered. I find that the aggressiveness of debt usage has been roughly constant through the 1990s. Finally, I examine whether the tax deductions that firms receive when their employees exercise nonqualified stock options substitute for interest tax deductions. Firms that use debt conservatively appear to substitute option-related deductions for interest, which might explain in part the low debt ratios for some firms. Option deductions are as large as interest expense for many companies.

The paper proceeds as outlined in Table 1.

1. Taxes and Financing Decisions

1.1 Theory and Empirical Predictions

I start by assuming that corporations are subject to a classical tax system, like in the United States, that interest, dividend, and capital gains income are taxed upon receipt by investors (at tax rates τ_P, τ_P, and τ_G, respectively), and that equity income is paid from the residual remaining after corporate taxation. In this system, corporate income is taxed at a rate τ_C and interest is paid from before-corporate-tax income. I also assume that equity is the marginal source of funds and that dividends are paid out according to a fixed payout policy. This assumption implies that retained earnings are not "trapped equity" that is implicitly taxed at the dividend tax rate, even while still retained (Auerbach (2001)). Finally, I assume that regulations or transactions costs prevent investors from following some of the elaborate tax-avoidance schemes implied by Miller and Scholes (1978) and others, in which investors borrow via insurance or other tax-free vehicles to avoid personal tax on interest or dividend income. In this framework, the advantage of a corporation paying out \$1 of income as interest rather than equity, net of corporate and personal taxes, is

$$(1-\tau_P) - (1-\tau_C)(1-\tau_E), \qquad (1)$$

where τ_E is the equity tax rate, often modeled as a weighted average of dividend and capital gains tax rates.

In their earliest work, MM (1958) ignore taxation and there is no advantage of debt over equity financing. In their "correction article", MM (1963) allow for corporate income taxation. With τ_P and τ_E equal to zero, Equation (1) collapses to τ_C: Because interest is tax deductible, relative to paying out earnings as equity, paying \$1 of interest saves τ_C in taxes. If a corporation were to pay out $\$r_D D$ of interest, where r_D is the interest rate on debt, D, it would reduce its tax liability by $\$\tau_C(r_D D)$. MM (1963) assume that debt is fixed, and therefore interest deductions are as risky as the debt that generates them and should be discounted by r_D. With perpetual debt, MM show that the value of a firm with debt financing is

$$V_{with\ debt} = V_{no\ debt} + \tau_C D \ , \qquad \textbf{(2)}$$

where the last term represents the tax advantage of debt.

There has been some debate about how to discount tax shield cash flows. Taggart (1991) and Benninga and Sarig (1997) show that if there are personal taxes, the tax benefits of debt should be discounted with after-personal-tax discount rates. This approach modifies Equation (2):

$$V_{with\ debt} = V_{no\ debt} + \frac{[(1-\tau_P) - (1-\tau_C)(1-\tau_E)]r_D D}{(1-\tau_P)r_D} \ . \qquad \textbf{(3)}$$

Miles and Ezzel (1980) 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 the cost of debt. Miles and Ezzel (1980) also argue that if first period financing is fixed, the discount factor should be adjusted by $(1+r_A)/(1+r_D)$. Sick (1990) summarizes these issues and shows the appropriate discount rate for various assumptions.

Other than in this paragraph, the results in this section are derived for a classical tax system in which interest is tax deductible but equity payments are not. If instead there is an imputation or integrated tax system (like in the U.K. and many other countries), equity holders receive a credit for taxes paid at the corporate level, which partially or fully eliminates the double taxation of equity income. This at least partially reduces the net tax advantage to debt. For example, ignoring personal taxes, Cooper and Nyborg (1999) show that the value of a levered firm in an imputation tax system equals

$$V_{with\ debt} = V_{no\ debt} + \frac{(\tau_C - \tau_I)}{(1-\tau_I)} D \ , \qquad \textbf{(4)}$$

where τ_I is the rate of imputation tax. If imputation results in a full tax credit at the corporate rate, then τ_I

= τ_C and there is no tax advantage to debt.[1]

Returning to the classical tax system, as long as $(1-\tau_P)$ is greater than $(1-\tau_C)(1-\tau_E)$, taking the partial derivative of Equation (2) or Equation (3) with respect to D implies that firms should maximize the amount of debt financing. Researchers recognized early on that this implication was too extreme and proposed that an offsetting cost must exist to discourage corner solutions involving 100% debt financing. The first cost proposed in the literature was the cost of bankruptcy, or more generally, costs of financial distress. Kraus and Litzenberger (1973) show in a state-preference framework that firms should trade-off the costs and benefits of debt to arrive at an optimal interior debt ratio. Scott (1976) shows the same with continuous variables.

The bankruptcy cost solution to why firms do not use too much debt is unsatisfactory empirically. Warner (1977) shows that direct costs of bankruptcy average no more than 5.3% ex post in railroad bankruptcies. More recently, Andrade and Kaplan (1998) show that the ex post costs of distress brought about by financing choice amount to 20% of firm value for a group of industrial firms. Miller (1977) notes that firms choose optimal debt policy by considering ex ante costs of distress, indicating that the costs mentioned above need to be multiplied by the conditional probability of distress to measure ex ante costs. Miller points out that ex ante costs of financial distress appear to be very small compared to the apparently large tax benefits of debt. Numerous papers since have proposed non-bankruptcy costs that could be traded off against the tax benefits of debt. For example, Jensen and Meckling (1976) introduce agency costs of equity and leverage-related deadweight costs, and Myers (1977) introduces underinvestment costs that can result from too much debt. Parrino and Weisbach (1999) use simulations to conclude that the agency costs of debt are too small to offset the tax benefits, and Esty (1998) empirically examines the effects of agency costs on capital structure in the banking industry.

None of the costs discussed in the previous two paragraphs have been demonstrated to be large enough to offset the apparent tax benefits of debt. Miller (1977) argues personal taxes introduce a large cost

[1]Swoboda and Zechner (1995) review additional tax issues related to imputation systems.

to using debt. (MM (1963) and Farrar and Selwyn (1967) took first steps in this direction.) 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), which as Fig. 1 shows was the case in 1977, then the net tax advantage to debt might be small or even negative in equilibrium. (A negative net tax advantage to debt corresponds to a negative value for Equation 1.[2]) Although he softened his stance in later writings (Miller (1988)), in 1977 Miller claimed that, at the margin, the personal tax disadvantage to interest was sufficient to completely offset the corporate tax advantage to debt: Investors demand a higher risk-adjusted return to hold debt to the extent that in equilibrium the higher cost of debt that firms must pay exactly offsets the corporate tax advantage.

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 curve 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 tax rates. By making the simplifying assumption that τ_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 a personal tax rate less than τ_P^*.

One of the key points from Miller's (1977) analysis is that equilibrium is reached in the debt market when aggregate demand equals aggregate supply, although it does not matter which particular firms supply debt. The implications are provocative: 1) there is no net tax advantage to debt (once one accounts for the higher yields investors demand because of the personal tax penalty associated with debt), 2) no particular firm has a tax-driven optimal capital structure, and 3) using debt financing does not increase firm value.

DeAngelo and Masulis (1980) broaden Miller's (1977) model and show that firms can have tax-driven optimal debt ratios in the presence of personal taxes. DeAngelo and Masulis essentially show that if

[2]Based on the statutory tax rates shown in Figure 1, Equation (1) is positive in every year since 1981, and so the Miller equilibrium can not hold in these years. However, if the depicted statutory tax rates are not representative of the tax rates applicable to the marginal investor(s), or if capital gains tax rates are effectively reduced through deferral and/or elimination at death, then the Miller Equilibrium is technically possible in these years.

firms have cross-sectionally differing amounts of nondebt tax shields, or differing propensity to benefit fully from interest tax deductions, the supply of debt function depicted in Figure 2 becomes downward sloping. (DeAngelo and Masulis argue extensively about nondebt tax shields in their paper; Kim (1989) highlights that firms will not always benefit fully from incremental interest deductions.) Therefore, 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 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, and that the tax benefits of debt add value for high-tax-rate firms.[3]

Other papers model the tax advantage to debt. Goldstein, Ju, and Leland (1999) use a dynamic contingent-claims model in which firms can restructure debt. They estimate that the typical firm should have tax benefits (net of the personal tax cost) equal to between eight and nine percent of firm value. Green and Hollifield (2001) 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%. If they were to factor in deferral at death and the lower tax rate on capital gains relative to the rate on dividends and interest, it would reduce the implicit tax rate on capital gains even further. (On the other hand, their calculations ignore the high turnover frequently observed for common stocks and mutual funds, which increases the effective tax rate on equity.) 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, 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 leads to interior optimal debt ratios.

[3]Dammon (1988) argues that the interaction between progressive personal tax rates and uncertainty about future outcomes leads to firm-specific optimal capital structures. In Dammon's model, investors' marginal tax rates and therefore the value of debt varies state-by-state in equilibrium, which gives varying incentives to issue debt based on how different firms' pretax cash flows co-vary with personal tax rates.

Talmor, Haugen, and Barnea (1985) claim that expected interest payments increase with debt-risk at a faster rate than the probability of default, implying that the marginal benefit of debt increases with the amount of debt in capital structure. Finally, Kane, Marcus, and McDonald (1984) argue that the price of an asset capitalizes the asset's potential tax shielding benefit, effectively passing the tax gain to the original owner of an asset.[4] In this environment, debt tax benefits are not a "bonus" to firm value but instead are the "loss avoided" by using debt appropriately. Kane et al. also argue that tax shields are not lost in bankruptcy but instead are recovered in what the next owner pays for the asset.

To summarize this section, the null hypotheses from Miller (1977) are

Null hypotheses: There is no net tax advantage to debt.
Firms do not have optimal tax-driven capital structures.
Firm value is not increased by using debt financing.

In contrast, MM (1963) and DeAngelo and Masulis (1980) conclude that there are tax incentives to use debt. The testable implications from the alternative hypotheses are

Prediction 1: corporations have a tax advantage to finance with debt that increases with the corporate marginal tax rate.

The effective corporate tax rate decreases with the probability that a firm will find itself in nontaxable status and with the amount of nondebt tax shields. Therefore, the incentive to finance with debt decreases with the probability of experiencing nontaxable states of the world and with nondebt tax shields.

Prediction 2: personal taxes on interest income offset the corporate tax advantage and discourage corporations from financing with debt.

Prediction 3: firm value increases with the tax benefits of debt.

In the next section I review empirical research that tests these predictions. One could argue that, for example, finding that debt ratios decline with expected bankruptcy costs is consistent with a tax-related trade-off

[4]Goolsbee (1997) provides partial support for this argument. He finds that between one-third and two-thirds of the tax benefit provided by investment tax credits is capitalized as an increase in the price of capital equipment, which he attributes to short-run inelasticity of asset supply. Likewise, Berger (1993) finds that about one-fourth of the tax credit that firms receive for increased research and development (R&D) spending is capitalized into the price paid to the suppliers of R&D inputs (with the other three-fourths resulting in quantity increases in R&D).

theory. I generally do not discuss the nontax variables, however, but instead focus on empirical results directly related to tax variables.

1.2 Evidence on Prediction 1: Do Corporate Taxes Affect Debt vs. Equity Policy?

Though many empirical tests can be interpreted in terms of more than one prediction, I group the empirical discussion by a paper's central test. The most common type of empirical capital structure analysis involves regressing the debt ratio on a tax variable and a collection of control variables. Because the control variables often represent several different theories about capital structure, and the empirical specifications are typically linear even though the models might not be, the regressions are usually interpreted as reduced-form tests of the tax hypothesis. Note that it can be important to control for tax effects even in research that focuses on non-tax issues. For example, if no tax variable is included, coefficients on variables designed to capture agency costs or profitability, which are probably correlated with tax rates, could be biased.

Cross-sectional and panel regressions: Bradley, Jarrell and Kim (1984) perform one of the early regression tests searching for evidence consistent with a tax-driven optimal capital structure. To test for tax effects along the lines suggested by DeAngelo and Masulis (1980), Bradley et al. regress the debt-to-value ratio on non debt tax shields (as measured by depreciation plus investment tax credits). The idea is that NDTS are negatively related to debt usage because they substitute for interest deductions. Bradley et al. find that debt is positively related to NDTS, opposite the tax prediction. This surprising finding, and others like it, prompted Stewart Myers to state in his 1984 presidential address to the American Finance Association, (p. 588) "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."

There are two experimental design issues found in many of the early empirical capital structure studies that work against finding tax effects: 1) the endogeneity of corporate tax status, and 2) measuring corporate marginal tax rates. Once these issues are properly addressed, there is plentiful evidence of the type called for by Myers.

Endogeneity of corporate tax status: If a company issues debt, it reduces its taxable income, which in turn can reduce its marginal tax rate (MTR). 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 imposes a negative bias on the tax coefficient. This could explain the negative tax coefficient detected in many studies. Note that endogeneity can affect all sorts of tax variables, including those based on NOLs or that partition firms based on taxes paid or on income measured after interest deductions.

There are two solutions to the endogeneity problem. MacKie-Mason (1990) proposed the first solution by looking at incremental financing choices (rather than the debt level) in his influential examination of 1,747 debt and equity issues from 1977-1987. 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 sometimes implicit in debt level studies). MacKie-Mason uses the lagged level of the MTR to explain current-period financing choice. He finds a positive relation between debt issuance and tax rates. (Besides tax rate endogeneity, another reason to use lagged MTRs is because this year's financing actions were often chosen by management some months earlier).

A number of other papers also find that incremental financing decisions are positively related to corporate marginal tax rates. Graham (1996a) finds positive tax effects for changes in the debt ratio for a large sample of Compustat firms. Shum (1996) finds similar evidence for Canadian firms (but does not discuss how to interpret these results with respect to dividend imputation in Canada). Schulman et al. (1996) find that debt levels are positively correlated to tax rates in Canada and New Zealand. 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 banks. Finally, Wang (2000) argues that a firm does not consider just the level of its tax rate when making incremental decisions, but rather how far the MTR is from "optimal". 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 presumably endogenously reduces the MTR and moves it closer to the optimum). It is problematic, of course, to measure the optimal tax rate, which Wang bases on the probability of bankruptcy (as measured by Altman's Z-score).

Examining changes in debt essentially answers the question "if a firm obtains financing or alters debt

usage, is this incremental decision 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 Fig. 1), which in isolation implies a reduction in the corporate use of debt. Givoly, Hahn, Ofer, and Sarig (1992) find that firms with high effective tax rates prior to tax reform reduce their debt the most after tax reform. This finding is somewhat surprising because their corporate MTR suffers from the negative endogeneity bias described above. Moreover, personal taxes fell by more than corporate taxes in 1986, and Gordon and MacKie-Mason (1990) show that the net incentive to use debt (i.e., corporate advantage minus personal disadvantage) increased following tax reform, as did aggregate corporate debt usage.[5] In another paper that examines how exogenous changes in tax rates affect debt decisions, Rajan and Zingales (1995) provide weak international evidence that taxes affect debt decisions.

If taxes are positively related to each incremental financing decision, it should be possible to detect positive tax effects in debt levels, if one could fix the endogenous negative effect on tax rates induced by cumulative debt usage. 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 effects (that is, based on income before debt interest and the interest component in lease payments are deducted). Graham et al. find a "spurious" negative correlation when they use an endogenously affected after-financing tax rate – but find a positive relation between debt-to-value and non-endogenous, before-financing tax rates.

Dittmar (2000) studies corporate spin-offs, which potentially allows her to avoid the endoeneity problem by observing capital structure in firms that experience a relatively "fresh start".[6] Also, recently spun off units are usually well capitalized, which hopefully allows Dittmar to avoid some problems of examining capital structure in start-up firms. Dittmar measures tax incentives with a trichotomous variable based on the existence of NOLs and the sign of taxable income. She does not find evidence that corporate tax rates affect

[5]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 1.3 below.

[6]By "fresh start," I mean "not affected by the accumulation of past capital structure decisions". However, it is still the case that, absent recapitalization, past decisions can influence the parent's and/or spun-off unit's new capital structure.

spin-off debt ratios.

Measuring corporate marginal tax rates: In addition to endogeneity, the other major problem that led to Myers' capital structure puzzle is related to properly quantifying corporate tax rates and incentives. For one thing, as insightful as it is in terms of deriving the logical possibility of firm-specific optimal capital structure, DeAngelo and Masulis (1980) unfortunately steered researchers to search for tax effects related to the substitution of nondebt tax shields for interest deductions. The problem with using NDTS, in the form of depreciation and investment tax credits, is that NDTS are positively correlated with profitability and investment. If profitable (i.e., high-tax rate) firms invest heavily and also borrow to invest, this can induce a positive relation between debt and NDTS and overwhelm the tax prediction that interest and NDTS are substitutes (Dammon and Senbet (1988)). MacKie-Mason (1990) and Dhaliwal, Trezevant, and Wang (1992) contemporaneously side-stepped this problem by interacting NDTS with a variable that identifies firms near "tax exhaustion," at which time the substitution of NDTS for interest is most important. Both papers find that tax-exhausted firms substitute away from debt when NDTS are high. 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 NDTS. Even though these papers find a negative relation between the interacted NDTS variable and debt usage, this solution is not ideal. One issue is that specifying tax exhaustion is somewhat ad hoc. Graham (1996a, p. 68) shows that the interacted NDTS variable has low power to detect tax effects and that NDTS have only a very small effect on more sophisticated measures of the marginal tax rate.

The other measurement issue related to calculating MTRs is that single-period measures miss important dynamic carryback and carryforward features of the tax code related to net operating losses, investment tax credits, and the alternative minimum tax. For example, 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. (Scholes and Wolfson (1992) define the economic marginal tax rate as the present value of current and future taxes owed on earning an extra dollar of income today, which accounts for the probability that taxes paid today will be refunded in the near future.) Analogously, a currently unprofitable firm might have a high current economic marginal tax rate if it is

expected to soon become and remain profitable (because extra income earned today will result in higher taxes paid in the future – today's extra income reduces losses to be carried forward to offset future income).

Shevlin (1987, 1990) uses simulation techniques to capture important dynamic features of the tax code related to net operating loss carrybacks and carryforwards.[7] The simulation approach uses historical data and also forecasts taxable income for numerous scenarios, determining for each scenario the present value consequences of earning an extra dollar of income in the current period, given the carryback and carryforward rules. The expected MTR is determined by averaging across the scenarios. Simulated tax rates vary across firms as the dynamic implications of tax-losses vary. The end result is greater cross-sectional variation in corporate tax rates (and hence tax incentives) than implied by statutory rates.

Graham (1996a) extends the simulation approach to include the effects of NDTS, investment tax credits, and the alternative minimum tax. Graham (1996b) demonstrates that simulated tax rates are the best commonly available proxy for the "true" marginal tax rate (when "true" is defined as the economic tax rate based on realized taxable income). Graham (1996a) uses simulated tax rates to document a positive relation between changes in debt ratios and tax rates, as do Graham et al. (1998) and Graham (1999) for debt levels. Alworth and Arachi (2000) show that after-financing simulated tax rates are positively related to changes in debt, as are before-financing simulated tax rates related to debt levels, for Italian firms.

Even though they account for dynamic features of the corporate tax code, one problem with simulated tax rates is that they are based on 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 either, and equal to zero if it has both), is a reasonable replacement for the simulated rate. With respect to the tax return issue, Plesko (2000) compares financial-statement-based simulated rates for 586 firms to a single-period tax variable calculated using actual tax return data. He finds that simulated rates (based on financial statements) are highly correlated with the tax return

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

tax variable. Financial-statement based simulated tax rates dominate many single-period tax variables that are based on actual tax return data. Plesko's evidence implies that the simulated tax rates are a robust measure of corporate tax status.

To summarize this section, once issues related to measuring debt policy and tax rates are addressed, researchers have supplied ample evidence in response to Myers' (1984) challenge to show that corporate debt usage is positively affected by tax rates. (While he may recognize the statistical significance of the empirical results mentioned above, 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.) Several challenges remain. First, none of the papers cited above provide time-series evidence that firm-specific changes in tax status affects debt policy. For example, Graham (1999) uses panel data to document that cross-sectional variation in tax status affects debt usage but finds no evidence that time-series variation does. It would be quite helpful to examine whether a firm uses more debt as it matures and presumably its tax liabilities increase. 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 papers do not allow for proper determination of statistical significance for the tax coefficients. (Graham et al. (1998) and Graham (1999) perform robustness checks to confirm the statistical significance of tax coefficients.) Therefore, it is not clear if all of the tax effects documented above are robustly significant. Third, very little research investigates capital structure tax issues contrasting classical versus imputation tax systems. Finally, most papers ignore the tax cost of receiving interest income from the investor's perspective, an issue to which I now turn.

1.3 Evidence on Prediction 2: Do Personal Taxes Affect Corporate Debt vs. 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 for the marginal investor, the personal tax costs of interest income (relative to the personal tax cost of equity) are 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 investor between debt and equity is unknown.

Personal taxes and capital structure: From the corporate perspective, the relatively high investor-level taxation of interest leads to a "personal tax penalty" for debt: investors demand a higher risk-adjusted return on debt than on equity. By rearranging Equation (1), the net tax advantage of debt can be represented as

$$\tau_C - [\tau_P - (1-\tau_C)\tau_E] , \quad (5)$$

where τ_C is the corporate income tax rate, τ_E is the personal tax rate on equity income, and τ_P is the personal tax rate on interest income. The bracketed term in Equation (5) accounts for the personal tax penalty: $\tau_P - (1-\tau_C)\tau_E$. To quantify the personal tax penalty, Gordon and MacKie-Mason (1990) and Graham (1999) estimate τ_E as a weighted combination of the tax rates on dividend and capital gains income, with the weights based on the dividend payout ratio. They assume that dividends are paid out according to a fixed policy, with the payout ratio held constant at its historic value. They also assume that the personal tax rate on interest and dividend income, τ_P, can be proxied with the tax rate implicit in the difference between the yield on taxable and tax-free government bonds (more on this below).

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. They document that aggregate corporate debt ratios increased slightly in response. Using firm-specific data, Graham (1999) finds that the net tax advantage of the first dollar of interest averaged between 140 and 650 basis points between 1980 and 1994. He also finds that the firms for which the net advantage is largest (e.g., approximately 2000 basis points for firms with dividend payout ratios in excess of 50%) use the most debt in virtually every year 1980 to 1994.[8] Graham also separately estimates a positive (negative) relation between the corporate tax rate (personal tax penalty) and debt usage, evidence that is robust to a number of different specifications.

Assuming clienteles based on investor tax-rates, Campello (2001) investigates the capital structure response to the large reduction in personal taxes (relative to the smaller reduction in corporate tax rates) after

[8]I update Graham's (1999) annual tax regressions from his Table 5, Panel B. The tax variable is the tax advantage of debt net of personal taxes, as expressed in Equation (5), with the personal tax penalty based on firm-specific dividend payout ratios. The dependent variable is debt-to-value. The estimated tax coefficients for 1995-1999 are 0.072, 0.046, 0.103, 0.135, 0.191, respectively, indicating that debt ratios are positively related to net tax incentives. All the tax coefficients are significant at a 1% level, except in 1996 when the p-value is 0.026.

TRA86. He finds that zero-dividend firms (which presumably have high-tax-rate investors) increased debt ratios in response to this reduction in the personal tax penalty, while high-dividend payout firms (which presumably have low-tax-rate investors) reduced debt usage relative to peer firms. Campello's findings lend some credibility to the Gordon-MacKie-Mason/Graham assumption linking the personal tax penalty to firm-specific dividend payout ratios.[9] 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.

Market-based evidence on the personal tax penalty: While consistent with personal taxes affecting corporate financing decisions, these results are not closely tied to market-based evidence about the tax characteristics of the marginal investor. Instead, Campello (2001), Lie and Lie (1999), Gordon and MacKie-Mason (1990) and Graham (1999) assume personal tax characteristics of clienteles based on a firm's payout policy (see Section 3 for more discussion of dividend clienteles). For example, the latter two papers implicitly assume that there is a certain marginal investor between equity and debt *and* (to estimate J_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 investor(s) between any two sets of securities, and deducing this information is difficult.

For example, assume that munis yield 7%, Treasuries 10%, and equities 8% (and assume that this equity return has been adjusted to make its risk equivalent to the risk of munis and Treasuries). In a Gordon/ MacKie-Mason/Graham type of equilibrium, $r_{muni} = r_{Treasury}(1- J_P) = r_{equity}(1- J_{equity}) = 7\%$, which implies that J_P=30% and J_{equity}=12.5%. This in turn implies that a large portion of equity returns are expected to come from capital gains (because J_{equity} is so much lower than J_P). However, things are rarely so simple. First, it is difficult to determine the risk-adjusted equity return.[10] Second, if there are frictions or transactions costs

[9]Additional corroborating evidence is provided by additional papers cited below that subset firms by dividend payout and then identify clientele-like stock price behavior.

[10]Gordon and MacKie-Mason (1990) Graham (1999) avoid the issue of adjusting the equity return. Instead, they assume that J_{div} equals the J_P implicit between munis and Treasuries, that $J_{effective\ cap\ gains}$= 0.25x $J_{statutory\ capital\ gains}$, and weight these two pieces by the portion of earnings returned as dividends and retained, respectively, to deduce

limiting arbitrage between pairs of markets (or if risk adjustments are not perfect), one could observe, say, munis yielding 7%, Treasuries 10%, and equities 12%. In this case, it is not clear which pair of securities should be used to deduce τ_p. If Treasuries and equities are used, the implicit τ_p could be negative. For example, assume that dividend payout is 15%, that $\tau_{\text{effective cap gains}}$=5%, and that τ_{equity} is modeled as a weighted average between dividends and retained earnings: τ_{equity}=0.15(1-τ_{div}) + 0.85(1-$\tau_{\text{effective cap gains}}$), where τ_{div}=τ_p. To ensure that $r_{\text{Treasury}}(1-\tau_p) = r_{\text{equity}}(1-\tau_{\text{equity}})$, in this example τ_p= -30%; clearly, market frictions drive relative returns in this example, so the usual approach can not be used to deduce the personal tax characteristics of the marginal investor(s). 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 investor(s) and which are "indirectly arbitraged", and it is even difficult to know whether capital gains or income tax rates are priced into security returns.

There has been a fair amount of research examining the investor tax rate implicit between municipals and taxable government bonds. Poterba (1989) finds that the yield difference between high-grade one-year munis and government bonds approximates the top statutory personal tax rate. However, even this experiment is not without difficulty. First, returns on long-term munis and taxables imply a tax rate for the marginal investor that is approximately half that implied by the short-term securities. Chalmers (1998) shows that this holds even when the muni interest payments are prefunded by T-bonds held in "defeasement", so differences in risk between munis and T-bonds do not explain this conundrum. Green (1993) proposes that taxable bonds might not be "fully taxable" because a portion of their return can come from capital gains (especially for long-term bonds) and also because to some degree the interest income can be offset by investment interest deductions. Mankiw and Poterba (1996) suggest that munis might be benchmarked to equities by one clientele of investors and taxable bonds might be benchmarked to equities by another clientele. In this case, munis and taxables might not be directly benchmarked to each other, which could explain the unusual implicit tax rate that is sometimes observed between the two securities.

τ_{equity}. It would be informative if future research could calibrate this approach to market-driven estimates of τ_{equity}.

Erickson and Maydew (1998) determine the identities, though not the tax rates, of the marginal investors in preferred and common stock. They study the market reaction to an announced (but never implemented) change in the dividends received deduction (DRD). The DRD allows corporations to deduct a portion of the dividends they receive from other corporations to attenuate "triple taxation" of equity income. Individual investors do not receive the DRD. When the Treasury made a surprise announcement in December, 1995 that they were planning to reduce the deduction from 70% to 50%, the typical preferred stock experienced a statistically significant -1% abnormal return, while there was no reaction among common stocks. This implies that corporations are the marginal investors (i.e., price-setters) in preferred stocks but not in common stocks.[11] One advantage of the Erickson and Maydew study is that they are able to control for risk when examining abnormal returns because they compare a security to itself before and after the exogenous announcement. The authors are unable to precisely deduce the tax rate of the marginal (corporate) investor, however, because they can not pinpoint the probability assigned by the market that the Treasury would actually implement the proposal.

Engel, Erickson, and Maydew (1999) and Irvine and Rosenfeld (2000) examine the exchange of preferred stock for monthly income preferred stock (MIPS). Preferred and MIPS are essentially identical securities – except that MIPS interest is tax deductible for corporations (like debt interest) 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. In sum, when issuing MIPS to retire preferred, corporations gain the tax benefit of interest deductibility with MIPS but experience two costs: underwriting costs, and possibly a personal tax penalty because investors are fully taxed on MIPS interest in contrast to corporate investors receiving the DRD on preferred dividends. It is an empirical question as to whether the corporate or investor tax-considerations dominate.

Engel et al. compare MIPS yields to preferred yields and estimate that the implicit tax cost of MIPS

[11]While Erickson and Maydew (1998) find no evidence that corporations are the marginal investors in common stocks, Geisler (1999) shows that common stock holdings by insurance companies vary positively with the allocation of the dividends received deduction among insurance companies. (The allocation of DRD can vary across insurance companies for regulatory reasons.) Geisler's evidence is consistent with clienteles: insurance companies respond to tax incentives to hold common stocks when their tax rate is low (i.e., when their DRD allocation is high).

(i.e., the personal tax penalty) is small: only 2.33% per dollar of MIPS face value. Netting personal tax costs and underwriting costs, they estimate that the net benefit of issuing MIPS is 28% per dollar of MIPS. This figure is close to the gross tax benefits of interest deductions, as estimated by the statutory corporate tax rate of 35%. Irvine and Rosenfeld (2000) use event study reactions to the announcement of MIPS-for-preferred exchanges and find that each dollar of interest adds approximately $0.26 to firm value. If firms always benefit fully from interest deductions, we would expect to observe $0.35 benefit per dollar or interest. The difference between the observed benefits and $0.35 is a measure of underwriting fees and the personal tax costs of interest because all other costs are essentially the same for MIPS and preferred.

The MIPS numbers, which are from the 1993-1998 time period, can be used to provide new evidence about τ_P for the marginal investor for interest. Note that personal tax costs deduced from Engel et al. (1999) and Irvine and Rosenfeld (2000) are the *incremental* investor tax costs of interest over those in preferred stock. To see this, assume that corporations are the marginal investors in preferred stock but not in debt. Given the similarity of the securities, in equilibrium we expect their after-investor-tax returns to be equal: $r_{preferred}(1-\tau_{DRD}) = r_{MIPS}(1-\tau_P)$. (Note that this equality might only hold within transactions cost bounds and that there might be different marginal investors in preferred stock and MIPS.) Plugging in $r_{preferred}$=8.14% and r_{MIPS}=8.37% from Engel et al.'s Table 4, and assuming that the marginal corporate investor is taxed at 35% so that τ_{DRD}=10.5%, we can back out the personal tax rate associated with interest income: 0.0814(1-0.105) = 0.0837(1-τ_P) implies that τ_P=13%. If I ignore the 30 basis point "yield premium" on MIPS imputed by Engel et al. and use r_{MIPS}=8.67%, τ_P=16%.

To the extent that results based on MIPS interest carry over to debt interest, finding τ_P=16% for the marginal debt investor is intriguing. First note that the mean after-financing corporate tax rate in 1993-1999 is approximately 18% (see Table 2), which is a rough estimate of the tax benefit of the *last* dollar of interest deduction (ignoring all costs). If we make Miller's (1977) assumptions that τ_E=0 and that all firms face the same 18% marginal benefit of debt, then τ_P should equal 18% (i.e., MC should equal MB), quite close to the τ_P=16% MIPS estimate. As argued by Green and Hollifield (2001), it would only take fairly small costs of bankruptcy to equalize the costs and benefits of debt. However, τ_E is most likely not zero for the marginal investor in equities. (Green and Hollifield (2001) argue that deferral reduces effective τ_E to about half its

statutory level.) Another issue is that the estimated MIPS costs and benefits are average, not marginal. Even if the marginal costs and benefits are equal in an equilibrium like that depicted in Figure 2a, there is a firm surplus/benefit to using debt. Therefore, even if personal tax costs are large enough at the margin to equal marginal benefits, there appear to be tax-driven preferred capital structures for some firms – presumably the incremental benefit would be near $0.35 per dollar for high-tax-rate firms, while the personal tax cost is only half that amount. Only if the nontax costs of debt are large for these high-tax rate firms could a Miller-type equilibrium hold, in which the benefits of debt are zero for all firms in equilibrium. Section 1.4 reviews research that investigates whether high-benefit firms have large nontax costs.

In sum, the implicit personal tax costs estimated here suggest that at the margin the tax costs and tax benefits might be of similar magnitude. However, they do not explain cross-sectionally why some inframarginal firms (with large tax benefits of interest) do not use more debt. More on this in Section 1.4. One other place where there has been a fair amount of success (though not unambiguously so) in deducing marginal investor tax characteristics is related to ex-day dividend returns. I defer this discussion to Section 3, where I explore how taxes affect corporate dividend policy.

Personal taxes and stock prices: In the most general sense, any research that shows that personal tax rates affect security returns sheds light on Miller's (1977) claims. For example, Brennan (1970) and Auerbach and King (1983) modify the CAPM in the presence of corporate and personal taxes. Using the CAPM-with-taxes specification, Auerbach (1983) finds evidence that tax-related preferences result in clienteles of investors that purchase stocks based on firm-specific dividend-price ratios. Constantinides (1983) and Dammon, Spatt, and Zhang (2001) investigate how favorable capital gains taxation affects investment and consumption choices. Seida and Wempe (2000) show that individual investors accelerated recognizing capital gains (and delayed losses) in anticipation of the increase in capital gains tax rates associated with the 1986 tax act. See Poterba (2001) for a review of articles related to how personal taxation affects the timing and value of asset sales and purchases.

Another group of papers investigates tax capitalization. These papers argue that personal taxes are capitalized into share prices via retained earnings. This in turn affects the relative tax advantage to debt because retained earnings are assumed to be the marginal source of funding. Harris and Kemsley (1999),

Collins and Kemsley (2000), and related papers assume that all earnings are eventually paid out as taxable dividends (and none via repurchases or liquidating dividends), which is consistent with the "new view" of the effects of dividend taxation.[12] They argue that (nearly) full dividend taxation is impounded into share prices and therefore, there is no incremental personal tax penalty when a firm pays a dividend. Therefore, personal taxes are large on interest income and small on equity income, and the personal tax penalty to debt financing is large.

Harris and Kemsley (1999) regress stock price on variables including retained earnings, and they infer that retained earnings are penalized at a dividend tax rate of approximately 47%. Collins and Kemsley (2000) argue that reinvesting current earnings leads to investor capital gains taxation when shares are sold, on top of the already impounded dividend taxation. This implies that there is no personal tax penalty to dividend payments (it is already impounded into share prices and therefore paying a dividend does not lead to further valuation effects). In fact, this leads to the counterintuitive argument that paying dividends leads to a reduction in future capital gains payments and therefore, *dividend payments are tax advantageous*. This implication only holds if arbitrage by tax-free investors is restricted to the point that personal investors are the marginal price-setters in stocks. Collins and Kemsley find empirical evidence that they interpret as being consistent with their hypotheses. An untested implication of their argument is that there should be a large value gain in deals that result in firms returning capital to investors in any form other than taxable dividends (such as mergers). Research into this area could be informative.

Rather than dividend taxes, an alternative argument is that capital gains taxes on future earnings are impounded into share prices. Consider a shareholder in Microsoft and assume that Microsoft is expected to pay dividends at some point in the distant future. If the market expects that low-tax investors are likely to be the dominant owners of Microsoft when the dividend payments are initiated, the only (future) tax that current investors face is capital gains. In support of this argument, Lang and Shackelford (2000) show that upon announcement that capital gains tax rates were going to decline, stock prices increased most among

[12]See Auerbach (2001) for cites. The "new view" or "trapped equity" assumptions are in contrast to the assumptions I made at the beginning of Section 1 that "equity is the marginal source of funds" and that "dividends are paid out according to a fixed payout policy".

firms for which capital gains are most important (i.e., firms with the lowest dividend yield). This is opposite the reaction predicted by lock-in models like Klein (2001), in which returns fall when capital gains rates fall, for firms with substantial accrued retained earnings, because the required return declines along with the tax rate. See Shevlin and Shackelford (2001) for further discussion of the tax capitalization literature.

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. For example, personal tax considerations could cause clientele behavior that is correlated with dividend-payout ratios. In a regression that omits personal tax considerations, the dividend-payout coefficient might erroneously be interpreted as supporting a nontax hypothesis. As another example, business students are often taught that the tax advantage of debt is captured by $J_C D$, which ignores personal tax effects. If it can be demonstrated that personal tax effects are not particularly important, it would simplify this and other modeling and interpretation issues. Future investigations of personal tax effects have a challenging task for a variety of reasons, 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.

1.4 Evidence on Prediction 3: Does the Tax Advantage of Debt Increase Firm Value?

The previous sections document cross-sectional evidence that firms respond to tax incentives when choosing debt policy. But it is not clear how large of a contribution the tax benefit makes towards firm value. If the M&M world depicted in Equation (2) holds, a back of the envelope calculation indicates that taxes contribute 14% to firm value for the average Compustat firm in 1999 ($0.14=J_C$ x debt-to-value); however, this calculation ignores personal tax and nontax costs of debt. This section begins by discussing early studies that tried to determine the tax benefit of interest deductibility based on market reactions to exchange offers. The section concludes by reviewing recent analyses based on benefit functions for interest deductions and on large-sample regressions.

Exchange offers: Prediction 3 (as well as Predictions 1 and 2) can potentially be tested using equity- and debt-issuance event studies. Masulis (1980) examines exchange offers, where one security is issued and

another simultaneously retired. By focusing on exchange offers, Masulis (1980) attempts to hold investment policy relatively constant while focusing on changes in capital structure. Masulis' tax hypothesis is that leverage-increasing (-decreasing) exchange offers increase (decrease) firm value because they increase (decrease) tax deductions, a direct test of Prediction 3. Masulis finds evidence consistent with his predictions: leverage-increasing exchange offers increase firm value by 7.6%, and leverage-decreasing transactions decrease firm 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). Masulis (1983) regresses stock returns on the change in debt and finds a coefficient that is statistically indistinguishable from the top statutory corporate tax rate, which is consistent with taxes increasing firm value as specified in Equation (2). Note, however, that this large coefficient implies near-zero personal tax and non-tax costs to debt.

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 towards 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. Graham, Hughson, and Zender (1999) point out that if a firm starts at its optimal capital structure, it will only perform an exchange offer if something moves the firm out of equilibrium. They derive conditions under which stock-price-maximizing exchanges are unrelated to marginal tax rates because market reactions aggregate tax and non-tax informational aspects of capital structure changes. Therefore, nontax reactions might explain Masulis' (1980) results. Several papers have found evidence along these lines.

First, some papers 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, the aforementioned papers find that exchange offers convey non-tax 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)). Moreover, Shah (1994) correlates exchange offers with information about reduced future cash flows (for leverage-decreasing offers) and decreased risk (for leverage-increasing offers), and Cornett and Travlos (1989) show that equity-for-debt exchanges convey information about negative future abnormal earnings.

As discussed in Section 1.3, Engel, Erickson, and Maydew (1999) and Irvine and Rosenfeld (2000) isolate the tax benefits of interest deductions in MIPS-for-preferred exchanges, without the complications related to information signaling. Engel et al. compare MIPS yields to preferred yields and conclude that the tax benefit of MIPS are approximately $0.28 per dollar of MIPS. 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 signaling respects, these studies provide straight-forward evidence of the positive contribution of taxes to firm value, net of underwriting and personal tax costs.

Cross-sectional regressions: More recently, Fama and French (1998) regress firm value on leverage and a collection of variables designed to control for information about earnings. In essence, they regress V_L on V_U and D, proxying for V_U with various controls for profitability and risk. Regardless of whether they use value or change in value as dependent variable, the coefficients on their leverage variables are either insignificant or negative. Fama and French interpret their results as being inconsistent with debt tax benefits having a first-order effect on firm value. Instead, leverage provides information about earnings that is not otherwise captured by the proxies for V_U. In other words, there is a measurement problem associated with the nondebt variables, which results in the debt coefficient picking up a negative valuation effect related to financial distress or some other large cost.

Kemsley and Nissim (2000) attempt to circumvent this measurement problem by switching the profitability variable (which they assume proxies V_U with error) to the left-hand side of the equation and putting V_L on the right-side. When they regress profitability on V_L and debt, the debt coefficient is positive, which they interpret as evidence that debt contributes to firm value. This coefficient is, however, difficult to interpret. First, their regression specification can be interpreted as capturing the effect of debt on profitability 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 is only positive for the entire sample in a nonlinear specification in which all the right-hand side variables are interacted with a crude measure of the discount rate. Finally, the debt coefficient measures the net benefit of debt. Their estimated coefficient of approximately 0.40 implies near-zero average costs and a near-zero personal tax penalty.

Marginal benefit functions: Graham (2000) takes a different approach to estimate the tax advantage to debt. Graham estimates the tax-reducing value of each incremental dollar of interest expense to construct interest deduction benefit functions. For the "$J_C D$" formula in Equation (2) to be accurate, it must be the case that each dollar of interest is fully deductible in every state of nature. It seems more likely that incremental interest are not fully deductible in every state of the world, and therefore that at some point the marginal benefit of incremental deductions begins to decline. Graham calls this point the "kink" in the benefit function.

If there is a tax-driven optimal capital structure, it occurs at the level of interest for which the (declining) marginal benefit function intersects the (increasing) marginal cost function. This argument is at the heart of the DeAngelo and Masulis (1980) derivation of optimal firm-specific capital structure (see Panel B in Figure 2), except that DeAngelo and Masulis emphasize nondebt tax shields as the cause of the declining marginal benefit of debt. As stated earlier, Graham (1996a) shows that NDTS play a minor role in marginal benefits of interest; instead, Graham (2000) highlights that marginal benefits decline because the probability increases with each incremental dollar of interest that it will not be fully valued in every state of the world, and hence the marginal benefit of incremental deductions declines.

By integrating under these benefit functions, Graham (2000) estimates that the tax benefit of debt equals approximately 9-10% of firm value averaged over 1980-1994 (ignoring all costs). I update Graham's estimates and find that the tax benefit of debt is 7.8%, 9.8%, 9.1%, 9.5%, and 7.7% of firm value in 1995-1999, respectively (see Table 2). The fact that the 1999 figure is less than the 14% estimated with the back of the envelope $J_C D$ calculation reflects the reduced value of interest deductions in some states of the world. I also update the "money left on the table" calculations in Graham (2000, his Figure 2). If all firms lever up to operate at the kink in their benefit functions, they could add 10.5% to firm value over the 1995-1999 period (see Table 2). This number can be interpreted either as a measure of the value loss due to conservative

corporate debt policy, or as a lower bound for the difficult-to-measure costs of debt that would occur if a company were to lever up to its kink. Graham (2001), Lemmon and Zender (2001) and Minton and Wruck (2001) try unsuccessfully to identify a nontax cost that is large enough in a trade-off sense to justify the apparently conservative debt policy of many firms. Thus, it is not clear which cost (if any) explains the apparently large, unexploited tax benefits to debt.

More work needs to be done measuring the market value of the tax benefits of debt for the broad cross-section of firms and explaining the apparently conservative debt policy of many firms. In Section 5, I present new evidence about whether the magnitude of tax deductions that firms receive when employees exercise stock options is sufficient to explain conservative debt policy.

1.5 Beyond Debt vs. Equity

Leasing: Firms can lease as an alternative to borrowing to buy an asset. "True" leases (as determined by the IRS) allow a lessee to deduct a lease payment from taxable income; the lessor purchases the asset, records the asset and depreciation on its books, and potentially borrows to obtain an interest tax deduction. If the lessee and lessor have the same cost of capital and tax rate, there is no tax advantage to leasing. If, however, the lessee has a lower tax rate or higher cost of capital than the lessor, the lessee can effectively "sell" the depreciation (and associated tax deduction) to the lessor, who values it more highly. The incentive for low-tax rate firms to lease is magnified when depreciation is accelerated.

There are two complications associated with investigating whether firms lease in response to tax incentives. First, because leasing expense is tax deductible, leasing endogenously reduces a firm's effective tax rate, which can bias an experiment in favor of detecting tax effects. Second, financial statement definitions of leasing are not one-to-one with IRS definitions. Graham, Lemmon, and Schallheim (1998) address the first issue by measuring tax incentives "but-for financing decisions", i.e., using tax rates based on 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. Many capital leases, in contrast, are handled like debt used to purchase an asset (and their use should therefore be positively related to tax rates), while some might be classified as true leases. Therefore it is difficult to determine the expected relation between tax rates and capital leases.

Graham et al. (1998) find that the use of operating leases is negatively related to before-financing tax rates, as predicted by theory, and that capital leases are unrelated. It seems plausible but has not been shown that tax effects affect the structure and pricing of leasing contracts. Graham et al. also confirm 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 leases (as was found in previous research).

The alternative minimum tax (AMT) potentially provides an additional tax incentive to lease. Firms are subject to the AMT if tax preference items (like accelerated depreciation) become relatively large. By leasing, firms can effectively sell accelerated depreciation to the lessor, thereby avoiding or reducing the effect of the AMT. However, O'Malley (1996) finds no evidence that firms systematically lease in response to tax incentives imposed by the AMT.

Pensions: Black (1980) assumes that pension plans and the overall company are a single economic entity that should have an integrated financing and investment strategy. Due to interest tax deductions, the cost of corporate borrowing is the after-tax cost of debt. Because they are tax-free entities, defined benefit pension plans (DBs) earn the before-tax rate of interest on bond holdings. Therefore, Black suggests that DBs should increase (decrease) bond (equity) holdings, while the rest of the firm should do the reverse. This action should not increase firm risk because the increase in corporate debt offerings is offset by the increase in bonds held in the pension plan. In a M&M (1963) world, the net effect is that the company earns J_C times the amount of bonds held, as in Equation (2). Tepper (1981) argues that there can be a tax advantage to the strategy of corporate borrowing and DBs investing in bonds, even in a Miller (1977) world. In this case, the benefit occurs when the DB is an inframarginal investor in bonds, thereby earning the "extra" return necessary to compensate individual investors for the personal tax penalty associated with interest income (i.e., DBs capture some of the investor surplus depicted in Figure 2). The Tepper incentive for DBs to hold bonds increases with the difference between personal tax rates on interest and equity income.

Myers (2001) finds evidence consistent with the Black (1980) case: she finds that DB bond holdings increase with a simulated corporate marginal tax rate. She does not find evidence consistent with the Tepper argument. In a less direct test of the same incentives, Thomas (1988) finds time-series evidence that firms

decrease DB contributions when their tax rate is falling, and cross-sectional evidence that high-tax firms have larger DB funding levels. Clinch and Shibano (1996) study pension reversions, which occur when a firm terminates an overfunded pension, settles its liabilities, and reverts the excess assets to the firm, all in one year. The reverted assets are taxable in the reversion year. Clinch and Shibano find that firms with the largest tax benefit of reverting do so, and also that firms time reversion decisions to occur in years with particularly large tax benefits. One nice thing about the Clinch and Shibano experiment is that their tax variable equals the tax consequence of reverting relative to the tax consequence associated with the next best alternative (e.g., amortizing the excess assets over several years).[13]

Debt maturity: Like Modiglinani and Miller (1958) for capital structure in general, Lewis (1990) derives irrelevance results for debt maturity. If corporate taxes are the only market imperfection, Lewis shows that the optimal firm-specific debt policy (i.e., optimal level of promised interest payments) can be achieved by various combinations of short- and long-term debt. This implies that firm value is unaffected by debt maturity structure and that capital market imperfections beyond corporate taxes, like costs to restructuring debt or underinvestment, are needed for debt maturity to matter.

Rather than modeling the simultaneous choice of debt level and maturity structure as in Lewis (1990), Brick and Ravid (1985) assume that firms choose debt level before debt maturity. If the expectations theory of interest rates holds, firms pay the same present value of interest in the long run regardless of debt maturity; however, issuing long-term debt accelerates interest payments, thus maximizing the present value of the interest tax shield. Brick and Ravid (1985) use this logic to argue that debt maturity should increase with the slope in the yield curve. Most empirical evidence does not support their prediction. Barclay and Smith (1995) and Stoh and Mauer (1996) include a stand-alone yield curve variable that is either insignificant or has the wrong sign. Guedes and Opler (1996) argue that the slope of the yield curve should only affect firms with a positive tax rate, and therefore interact the yield curve variable with the corporate marginal tax

[13]Chaplinsky and Niehaus (1990) describe the potential tax benefits of Employee Stock Ownership Plans, a form of defined contribution benefit plan. ESOPs offer deferred compensation to employees and a deductible expense to employers. ESOPs are designed to allow firms to borrow to purchase own-company stock on employees' behalf, which provides an interest deduction to the firm. Moreover, half of the interest income received by the lenders is tax-free. Shackelford (1991) finds that lenders keep only 20-30% of the tax benefit associated with this interest, with the remainder being passed along to the ESOP in the form of a lower interest rate on the loan.

rate. Neither Guedes and Opler (using a crude measure of the corporate tax rate), nor Harwood and Manzon (1998, using a simulated corporate tax rate) find a significant coefficient on the yield curve variable. The one exception is Newberry and Novack (1999), who use a dummy variable equal to one during 1992 and 1993 (when the term premium was relatively high) and equal to zero for all other years 1987-1995. Newberry and Novack find a positive coefficient on the yield curve dummy in their public debt regression but not in their private debt analysis.

Kane, Marcus, and McDonald (1985) determine optimal debt maturity in a model that trades off corporate tax benefits with personal tax, bankruptcy, and flotation costs. The implications of their model are that debt maturity decreases with the corporate MTR and increases with the personal tax rate: long maturity implies less frequent recapitalization and relatively low transactions costs, so long-term debt can be desireable even if the net tax benefit is low. Maturity also increases with the volatility of firm value: volatile firms are more likely to restructure debt. Stoh and Mauer (1996) find support for the latter prediction: volatile firms generally use shorter term debt. The evidence is weaker related to the tax rate prediction. Stoh and Mauer find that debt maturity decreases with corporate tax rates – but their MTR variable is very crude (equal to income tax expense divided by pretax income when this ratio is between zero and one, and equal to zero otherwise). Opler and Guedes (1996) find a negative coefficient on a tax expense divided by assets variable but the wrong sign on an NOL-based tax variable. Finally, Harwood and Manzon (1998) and Newberry and Novack (1999) find a positive relation between a simulated tax rate variable and debt maturity, opposite the Kane et al. prediction.[14] A positive coefficient makes sense if large simulated MTRs identify firms that use long-term debt cause they are relatively likely to be able to deduct interest in current and future periods.

[14]Harwood and Manzon's variable equals the Graham (1996a) simulated tax rate divided by the top statutory tax rate. This variable has a large value for firms that do not currently have NOLs and that do not expect to experience a loss in the near future. Harwood and Manzon predict a positive relation between this tax variable and debt maturity. They argue that firms with large values for the tax variable are likely to fully utilize tax deductions in the future, and therefore lock into long-term debt now. I perform a more direct test on the hypothesis that uncertainty about future tax-paying status reduces the use of long-term debt. In unpublished analysis, I use the standard deviation of the simulated marginal tax rate to measure uncertainty about tax-paying status, with the standard deviation calculated across the simulated scenarios for any given firm-year. I do not find any relation between debt maturity and uncertainty about tax-paying status.

Finally, debt maturity can affect the tax-timing option for firms to opportunely retire debt (e.g., Emery, Lewellen, and Mauer (1988)). If the corporate tax function is convex, the expected present value tax benefit of short-term debt declines with interest rate volatility, while the tax deductions with long-term debt are fixed. Therefore, long-term debt is preferred when interest rates are volatile. Long-term debt also increases the value of the timing option for investors to tax-trade securities (Kim, Mauer, and Stohs (1995)) because option value increases with security maturity and long-term bond prices are more sensitive to changes in interest rates. Kim et al. (1995) find that debt maturity increases with interest rate volatility but Guedes and Opler (1996) do not. Nor do Guedes and Opler find significance for a second variable that interacts interest rate volatility with a corporate MTR variable.

The evidence linking tax incentives to debt maturity is mixed. One thing that makes it difficult to draw general conclusions is that debt maturity is defined differently in various papers. Barclay and Smith (1995) use a dependent variable measuring the portion of outstanding debt that matures in four or more years, Guedes and Opler (1996) use the log of the term to maturity for new debt issues, Stohs and Mauer (1996) use the book value weighted-average of the maturity of a firm's outstanding debt, Newberry and Novack use the same for new issues, and Harwood and Manzon (1998) use the portion of outstanding debt that is long-term. Another issue that might affect inference about tax variables is the apparently nonlinear relation between debt maturity and nontax influences (Guedes and Opler (1996)). Unless the nonlinearity of the overall specification is properly controlled, it might adversely affect the ability to detect tax effects. Finally, the yield curve was never inverted during the periods studied by most of these papers, so the tests of Brick and Ravid (1985) focus on the steepness of the yield curve, rather than the sign.

Start-ups and small firms: By studying capital structure decisions among newly formed firms, one might be able to avoid long-lasting effects of past financing decisions. For example, Baker and Wurgler (2001) show that today's market-to-book ratio and debt-equity issuance decisions continue to affect firm's debt ratios for ten or more years. Esty, Qureshi, and Olson (2000) describe various start-up financing issues including selecting a target debt ratio, as well as how market conditions and collateralization affect the sequence of initial financing choices.

Pittman (2001) examines the determinants debt ratios in the years following IPO. He performs annual

(i.e., years since IPO), cross-sectional regressions and finds evidence that taxes exert a positive effect on the use of debt in the early years of a firm's public life, but that this effect wanes as the firm ages. He attributes this waning to refinancing transactions costs increasing as a firm ages. Note that Pittman's evidence is not time-series in terms of a firm altering capital structure as its tax rate changes through time, although Pittman does link debt policy to firm age. Pittman also finds that firms use relatively more NDTS as they age.

Almost all capital structure papers study Compustat companies. Ayers, Cloyd, and Robinson (2001) instead examine small companies with less than 500 employees that participated in the 1993 Federal Reserve National Survey of Small Business Finances. 2,600 firms meet the Ayers et al. data requirements. Ayers et al. regress interest expense divided by pre-interest pre-NDTS income on various variables including tax expense divided by pre-interest income. They find a positive coefficient on the tax variable in both their outside and inside debt regressions (i.e., interest owed to non-owners and owners, respectively). It is difficult to compare their results to Compusat-based research because Ayers et al. use a different dependent variable than most studies, and they delete firms with a negative value for the dependent variable (which raises statistical issues).

Corporate risk management and income smoothing: 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 logic is that the government effectively holds a call option on corporate tax liabilities, the value of which can be reduced by reducing 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 tax refunds for losses are usually spread through time via tax-loss carrybacks and carryforwards, assuming that the firm eventually becomes profitable. Due to the time value of money, therefore, the tax code is convex because the present value tax benefit of $1 in losses is less than the tax cost of $1 in profits. Firms have incentive to use derivatives to shift taxable income from good to bad states to reduce volatility and expected tax liabilities. If the Smith and Stulz argument is true, controlling for taxes is important in research that investigates non-tax hedging incentives that are related to income volatility.

Many papers include variables based on the existence of NOL or tax credit carryforwards to proxy

for tax function convexity. These papers generally do not find evidence that convexity affects the corporate use of derivatives to hedge (e.g., Nance et al (1993) for Fortune 500 types of firms or Tufano (1996) for gold-mining firms). Graham and Smith (1999) argue that these variables are poor proxies for tax function convexity. Graham and Smith 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 (2001) use regression coefficients from Graham and Smith (1999) (from a regression of explicitly-measured-convexity on firm characteristics and NOL status) to estimate convexity and find that hedging among gold-mining firms is positively related to estimated convexity.

The second tax incentive to hedge is to increase debt capacity. Ross (1997) and Leland (1998) model the primary benefit of debt financing as the tax deductibility of interest and show that, by hedging, firms can increase debt capacity and therefore firm value. Graham and Rogers (2001) investigate the joint hedging/capital structure decision to see whether firms hedge in response to this tax incentive. They 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.

Hedging with derivatives transfers income across states within a given time-period. In constrast, earnings management is usually thought of as smoothing income through time. Like the hedging case, tax convexity can provide an incentive to smooth income; however, tax incentives to smooth are more unidirectional. All else 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. (Scholes, Wilson, and Wolfson (1992) find that firms delayed recognizing income in 1986 in anticipation of lower future tax rates.) Three conditions can lead to a convexity-like incentive to smooth that works against the incentive to delay income recognition: 1) a progressive tax function, 2) NOLs being less than fully valued due to limitations on use and the time value of money, or 3) an expectation that tax rates will rise in the future. Barton (2000) does not explicitly consider these conditions. He uses a crude measure of convexity: the excess

of a firm's simulated 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 his measure of convexity, which he interprets as evidence of income smoothing.

2. Taxes and Multinational Financing Decisions

Section 1 examines capital structure choices in a single-country context. This section reviews how multinational operations can affect and be affected by corporate financing decisions in a multinational firm. The perspective is generally for a firm headquartered in the U.S but many of the implications hold if the firm is headquartered elsewhere. To focus on the central factors that affect multinational firms, I make several simplifying assumptions (described below). For a more detailed description of international tax law, see Hines (1996) or Scholes, Wolfson, Erickson, Maydew, and Shevlin (2002) and the references therein.

2.1 Tax Incentives and Financial Policy in Multinational Firms: Theory

A multinational corporation can finance its foreign operations with internal equity (i.e., an equity infusion from a parent or subsidiary to an affiliated subsidiary), internal debt (i.e., a loan from the parent to a subsidiary), external funding, or earnings retained by the foreign subsidiary. If internal equity is used, the parent receives its return on equity when the subsidiary repatriates dividends back to the home country. Dividend payments based on active operating earnings can usually be deferred indefinitely, until the parent needs an infusion of cash, or to optimize the worldwide tax situation of the firm. In contrast, interest from internal debt is paid according to a fixed schedule. Like a repatriated dividend, interest counts as "world-wide income" on the U.S. tax return of the parent. Unlike a repatriated dividend, the interest is often deductible on the foreign tax return, allowing for a foreign tax deduction analogous to the tax benefit of debt described in Section 1.[15]

[15]There are restrictions to shifting interest deductions abroad by lending from the domestic parent to the foreign subsidiary: thin capitalization rules (i.e., limits on the magnitude of foreign debt ratios), withholding taxes imposed by the foreign government on interest payments and other repatriations, and netting rules that restrict the effect of interest payments on the determination of foreign source income (Newberry and Dhaliwal (2000) and Scholes et al. (2002)). For example, withholding taxes are above and beyond foreign income taxes and are collected by foreign governments on remittances to parent firms.

Two important items affect the financing choices of U.S.-based multinational firms: foreign tax credits and interest allocation rules. 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 U.S., regardless of where they earn income. At the same time, the government recognizes that income earned abroad is usually taxed by a foreign entity, so the U.S. offers foreign tax credits to offset taxes paid abroad. If the U.S. did not offer such credits, the foreign operations of U.S. corporations would face double taxation and therefore have a tough time competing with foreign corporations. For the purposes of this analysis, 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 active (i.e., non-passive) foreign source income repatriated from a particular country.

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 the foreign taxes paid but still must remit to the U.S. government taxes equal to (τ_{US} - τ_{For})*(foreign source income). For example, if repatriated foreign earnings are \$200, τ_{For}=15%, and τ_{US} = 35%, the firm must pay \$40 in tax to the U.S. The firm in this example is "deficit credit" because it does not have sufficient foreign tax credits (FTCs) to avoid paying U.S. tax. In contrast, if $\tau_{For} > \tau_{US}$, the firm does not have to pay U.S. tax. For example, if τ_{For}=45% and τ_{US} = 35% and repatriated earnings are \$200, the firm pays \$90 in foreign tax; however, the firm's foreign tax credits are limited to FTC_{allow}=\$70 (=min[\$200 τ_{US},\$200τ_{For}]), which is just enough to shield it from U.S. tax obligation. The \$20 in unused FTCs can be carried back up to two years or carried forward up to five years to offset taxes on repatriated income (or they can be deducted rather than used as a credit). The firm in this example is "excess credit" because it has more FTCs than it is allowed to use in the current year.

The second important tax principle affecting multinational corporate financing decisions is the allocation of debt interest between domestic and foreign operations. Via the allocation of domestic interest, the U.S. limits allowable foreign tax credits, thereby possibly reducing the tax benefit of domestic debt. The U.S. 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 U.S. allocates domestic interest to foreign operations based on the proportion of total assets that are in foreign subsidiaries. In rough terms, if two-thirds of a

company's worldwide assets are held by foreign subsidiaries, then two-thirds of domestic interest deductions are allocated to foreign income when determining the allowable-FTC calculation. (Note that this is a U.S. government ruling and does not mean that foreign governments recognize the allocated interest as a deduction against foreign income.) As described below, this allocation procedure can reduce the tax incentive for U.S. firms to use domestic debt. Note that the allocation of a portion of domestic interest abroad technically affects only the allowable-FTC calculation; that is, ignoring FTC, domestic interest deductions are not directly affected. For an excess credit firm, however, the effect on world-wide tax liability is equivalent to reducing domestic deductions. One implication of the interest allocation rules is that debt policy research can not assume that financial statement (or Compustat) "domestic interest expense" is fully beneficial to U.S. multinationals.

Table 3 summarizes the tax incentives to use external domestic or foreign debt in a one-period model. The table is intended to be self-explanatory so I emphasize only the main points in the text. The model ignores personal taxes, carryforwards and carrybacks, and assumes that all foreign income is repatriated each year. The worldwide tax liability (Tax_{World}) is equal to the sum of U.S. tax on worldwide income (Tax_{US}) and foreign tax on foreign income (Tax_{For}), less allowable FTCs. The table shows the change in Tax_{World} that occurs, for various tax credit and interest allocation situations, when an additional dollar of domestic or foreign interest is deducted.[16]

For the most part, the results in Table 3 are what you would expect without thinking too deeply about the complexities of foreign taxes. If Tax_{US} is zero (rows (1) and (3)) or domestic income is negative (row (6)), there is no tax benefit from issuing domestic debt; there is, however, a benefit of J_{For} to deducting $1 of foreign interest when foreign income is positive (rows (1) and (6)).[17] If foreign income is negative but domestic income is positive (row (2)), there is no tax incentive to issue foreign debt but an incremental dollar

[16]This model ignores many techniques by which firms can minimize worldwide taxes. See Scholes et al. (2002) for more information on these alternative mechanisms.

[17]If there is a positive probability that tax-losses will be used if carried backward or forward, the tax benefit can be positive even in rows (1), (3), or (6). Conversely, if there is a positive probability that losses will occur and be carried back from the future, positive tax benefits might be smaller than those shown in the table. Also, in a more complicated model, one could also net out the personal tax costs associated with interest income. Finally, see Altshuler and Newlon (1993) for the marginal tax costs of repatriations when there are also withholding taxes.

of domestic interest provides a benefit of J_{US}.

Two situations are more subtle. If a U.S. multinational is deficit credit (i.e., J_{US} is greater than J_{For}) and profitable both in the U.S. and overseas (row (4)), a dollar of domestic or foreign interest produces a tax benefit of J_{US}. To see how foreign interest produces a tax benefit proportional to J_{US}, consider a case in which a multinational earns \$2 of income in a country with J_{For}=45% and \$4 of income in a country with J_{For}=25%, and assume that J_{US}=35%. The \$2 of high-tax foreign income produces Tax_{For}=\$0.90. The firm receives FTC_{allow}=\$0.70 on this income and has \$0.20 of unused FTCs. The \$4 of low-tax foreign income produces Tax_{For}=\$1.00. As a stand-alone item, this income produces \$0.40 of U.S. tax at repatriation (\$4*(35%-25%)); however, the \$0.20 of extra FTC offsets half of this U.S. tax liability. On net the firm pays the U.S. \$0.20 in tax on foreign earnings and has a total tax liability of Tax_{World}=\$2.10 (\$2.10= \$0.90 in high-tax country, \$1.00 in low-tax country, and \$0.20 on income repatriated from low-tax country).[18] If this firm deducts \$1 of interest in the low-tax country, it reduces its tax bill by \$0.35 (\$0.25 reduction in Tax_{For} and \$0.10 reduction in U.S. tax owed on that dollar). If the firm uses \$1 of interest in the high-tax country, it reduces its tax bill by \$0.35 (\$0.45 reduction in Tax_{For} but \$0.10 less FTC available to offset taxes owed on the income repatriated from the low-tax country.) Either way, the tax benefit of deducting \$1 of foreign interest is J_{US} when a firm is deficit credit and profitable both in the U.S. and overseas.

The second subtle situation involves the tax benefit of deducting domestic interest when a firm is excess credit and Tax_{US} and Tax_{For} are both positive (row (5)). In this case, a portion of domestic interest is allocated to foreign source income, thereby reducing the benefit of a dollar of interest by the ratio of foreign assets to worldwide assets. (Recall that this allocated interest will not reduce Tax_{For}.) The allocation of domestic interest reduces the incentive of an excess credit firm to issue domestic debt, especially when the firm has substantial foreign assets. Altshuler and Mintz (1995) note that more than 60% of firms were excess credit during the late 1980s, so interest allocation is potentially important.

The analysis can be modified to examine the tax incentives associated with the parent supplying the

[18]In most situations the income from the high- and low-tax country would be summed and treated as income from one "basket", with J_{For}=(4x25% + 2x45%)/6=31.67%. I treat the countries separately in this example to highlight how income from one country can lead to FTCs that shield income repatriated from another country.

subsidiary with internal debt. The incentive is similar to that for external foreign debt shown in the rightmost column in Table 3, with one difference: with internal debt, the interest is taxable to the parent at rate J_{US} when $Tax_{US}>0$, so in some cases positive J_{US} should be added in the rightmost column. Specifically, if the debt is internal rather than external, the entries in the rightmost column are $-J_{For}$, $+J_{US}$, 0, 0, $J_{US} - J_{For}$, and $J_{US} - J_{For}$ in rows (1)-(6), respectively. (Recall that a negative term means tax savings.) Note that in the deficit credit case (row (4)), there is no tax incentive to use internal debt because the net benefit of deducting in the foreign country is exactly offset by the increased tax in the home country. In the excess credit case (rows (5) and (6)), the net tax benefit is $J_{For} - J_{US}$. Although smaller than the tax benefit of using external debt, multinational firm's tax incentive to issue debt increases with J_{For}. In row (2), when $Tax_{For}=0$ and $Tax_{US}>0$, there is a tax disincentive of J_{US} per dollar of internal interest: the extra foreign interest does not further reduce Tax_{For} and yet there is a positive tax liability of J_{US} on the remitted interest. In contrast, when $Tax_{US}=0$ (rows (1) and (3)) using internal rather than external debt does not change the entries in Table 3: there is no tax on the interest received by the parent because the firm otherwise has domestic losses.

FTCs can affect tax incentives to use debt in a manner that is not reflected in a one-period model. Assume that a multinational firm has accumulated unused FTCs that it has carried forward to the present (or assume that it anticipates receiving excess FTCs sometime in the next two years). If a firm has carried forward FTCs from previous years it very likely was excess credit, and therefore subject to $J_{For}> J_{US}$ at some point in the past. For the most part, a firm can use these accumulated FTCs only if the foreign tax rate becomes smaller than the U.S. corporate income tax rate. This can occur if there is an exogenous shift in relative tax rates (J_{For} and J_{US}) or if a firm repatriates more foreign source income from low-tax countries, thereby reducing the average J_{For} (i.e., in the latter case, the firm can endogenously reduce J_{For}). If a firm expects to use accumulated FTCs to reduce taxes, the FTCs compete with interest deductions in a DeAngelo-and-Masulis sense and reduce the incentive to finance with debt.

2.2 Empirical Evidence Related to Multinational Tax Incentives to Use Debt

Testing multinational tax hypotheses is difficult because the data are hard to obtain and noisy. Table 4 summarizes some empirical evidence related to multinational debt policy. Most of the international capital structure tests are based on implications found in row (4) and especially row (5). Two related predictions are

that excess credit firms should have less incentive than deficit credit firms to use domestic debt, and the incentive to use debt for excess credit firms declines with the proportion of assets that are foreign. The evidence is generally consistent with these predictions. 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. Newberry (1998) and Newberry and Dhaliwal (2000) find that the likelihood of issuing domestic debt is highest when a firm is deficit credit and when FTC limitations least reduce the benefit of domestic deductions. Altshuler and Mintz (1995) show that use of foreign debt increases with the proportion of foreign assets and with J_{For}.

A related prediction is that firms shift away from debt financing when interest is allocated abroad. Collins and Shackelford (1992) show that firms increase their use of preferred stock when domestic interest allocation is unfavorable. Froot and Hines (1995) point out that, unlike interest, lease payments are not allocable, and show that excess credit firms rely more heavily on leasing.

Multinationals should arrange for foreign subsidiaries to make (external or internal) interest or royalty payments when the foreign tax rate is high. When the firm is excess credit, it can be attractive to finance the subsidiary with internal debt rather than equity. The interest payments from the subsidiary to the parent are usually tax deductible on the subsidiary's foreign tax return thereby reducing foreign taxes. In addition, the interest payments increase foreign source income from the perspective of the U.S. government, thereby increasing allowable FTCs. 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 J_{For}. Similarly, Newberry and Dhaliwahl (2000) find that the propensity to issue bonds in foreign markets increases in J_{For}. Hines (1995) demonstrates that royalty payments increase when they are a cheaper form of repatriation than are dividends. Finally, Grubert (1998) finds that an increase in the price of one form of remittance does not reduce total payments. Firms hold the total constant and substitute between different forms of remittance, such as dividends, interest, or royalties.

I am not aware of any research that investigates whether firms with *accumulated* foreign tax credits rely on relatively little domestic debt. Further, other than Altshuler and Mintz (1995), the research cited in this section uses very general specifications to test for foreign tax incentives or the effects of interest

allocation. For example, separate terms indicating excess credit status, J_{For}, or the ratio of foreign to worldwide assets are often used, rather than interacting the variables in the manner suggested by the comparative statics in Table 3. Finally, little research investigates some of the sharper predictions (such as no tax incentive to use internal debt for deficit credit firms). To the extent that data are available, there is room to perform important research in the area of international tax.

2.3 Other Predictions and Evidence About Multinational Tax Incentives

Interest allocation can be avoided altogether if the domestic borrowing is performed by a domestic subsidiary that is less then 80% owned by the parent (although this subsidiary must allocate interest on its own books). I am unaware of any systematic research investigating this issue. Scholes et al. (2002) present an example describing how Ford Motor Co. implemented this strategy.

Besides directly altering where and whether it issues debt, there are many related mechanisms by which a firm might respond to multinational tax law. A company might alter its transfer prices (the prices at which goods and services are transferred between related entities) to shift income from the high-tax to the low-tax affiliate. Though transfer prices are supposed to be "arms-length prices", the rules are vague enough to allow wiggle-room. Properly designed, transfer pricing allows for tax-free dividend repatriation. Consistent with this means of reducing overall taxes, Lall (1973) finds that multinational firms overinvoice their low-tax Columbian subsidiaries. Mills and Newberry (2000) find that shifting income to foreign operations increases in the difference between the U.S. tax rate and the global tax rate. Alternatively, multinational firms can use "triangle schemes" in which one subsidiary is capitalized by or invested in by another affiliate subsidiary (Altshuler and Grubert (2000)). These schemes allow firms to optimally mix remittances from high- and low-tax subsidiaries in ways that reduce domestic taxes on foreign source income.

More generally, firms can time dividend repatriation to coincide with low overall tax cost to the parent and subsidiary. In particular, deficit credit firms owe U.S. tax when they repatriate dividends, so they have incentive to delay repatriation. In contrast, excess credit firms often do not owe additional tax upon repatriation. Taking debt versus equity choices as given, Hines and Hubbard (1990) find that excess credit firms repatriate more than do deficit credit firms, and that repatriation by deficit credit firms is inversely related to the tax cost of doing so. Altshuler and Newlon (1993) show that most repatriated dividends are

"cross-credited"; that is, the parent firm simultaneously receives payments from both high- and low-foreign-tax subsidiaries, and can use the extra credits from one source to offset potential domestic taxes from another.

3. Taxes and Payout Policy

This section focuses on how taxes affect dividend policy. For broader reviews of dividend policy, see Allen and Michaely (1995, 2001) and Poterba (2001). One interesting thing about dividend tax research is that it is centered on personal tax considerations, the very issue that capital structure research often ignores or handles crudely (see Section 1).

Modern dividend research began with Lintner's (1956) field interviews with 28 firms. Lintner found that dividends are stable, appear to adjust towards an earnings-payout target, and are rarely reduced even if funds are needed for investment. Miller and Modiglinani (1961) laid the theoretical foundation of dividend research and concluded 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 dividend policy may matter. In particular, if at the margin dividends are taxed more heavily than are capital gains, firms have an incentive to return equity capital via share repurchases rather than dividends. In contrast to the regular payments (and tax liability) of dividend payments, repurchases allow investors to time their income and tax streams.

Based on this implication, academics have long advised that equity capital be returned via share repurchases. For decades, corporations apparently ignored this advice, until the mid-1980s when repurchases first grew to 20-30% of corporate earnings. Repurchase activity continued to increase, and in 1998 aggregate share repurchases were larger than aggregate dividend payout for the first time (Grullon and Michaely (2000)). Moreover, Fama and French (2000) note that, due to the formation of thousands of new, no-dividend firms in the 1990s, the portion of firms paying dividends declined to less than one-in five NYSE and NASDAQ firms (in comparison to nearly two-thirds in the 1960s and 1970s).

McDonald (2001) links repurchase activity to interest deductions. He points out that many companies write puts on their shares as part of a repurchase program. The corporation experiences a cash inflow today when it writes the put, and an outflow in the future when it repurchases the share. This transaction can be

replicated by borrowing today to purchase the share on the open market and repaying the loan in the future. The one difference is that there are no tax effects when a firm writes a put on its own shares, while the firm receives a tax deduction with the synthetic put. McDonald argues that any option activity the corporation undertakes that involves implicit borrowing (lending) is tax disadvantaged (advantaged) relative to actually borrowing as part of a synthetic option strategy. The fact that many firms write puts or purchase calls on their own shares implies that many firms bypass potential interest deductions. This finding is consistent with Graham's (2000) conclusion that many firms appear conservative in their pursuit of interest deductions.

I continue by reviewing research about dividend clienteles. Then, I examine how dividend policy affects share prices, in terms of dividend-paying shares requiring a larger return and affecting ex-dividend day stock returns. This evidence is informative about the personal tax advantage of equity (relative to debt) and also about whether investor's prefer capital gains over dividends. The section ends with a review of the effect of dividends on firm value.

Dividend clienteles: Miller and Modigliani (1961) suggest that firms that pay (do not pay) substantial dividends might attract clienteles of low (high) tax-rate investors. If there are costs to switching clienteles, this might lead to stable dividend policy at any particular firm, to meet the tax preferences of its investors. Moreover, if this same clientele owns the firm's debt, it affects the magnitude of the personal tax penalty the firm experiences when it issues debt. Absent costs of switching clienteles, however, Allen and Michaely (1995) show by example that firm value is not affected by dividend policy if the marginal price-setter in the economy is tax-free.

Blume, Crocket, and Friend (1974), Petit (1977), and Chaplinsky and Seyhun (1987) provide weak evidence that dividend yield on investor shareholdings is negatively correlated with personal tax rates; Lewellen, Stanley, Lease, and Schlarbaum (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) finds evidence that the dividend-price ratio is the only firm characteristic that explains the relative tax advantage of capital gains. Sholz (1992) uses a sophisticated measure of the tax preference of dividends over capital gains, controls for household wealth, and indirectly controls for risk. Sholz finds a negative relation between the

dividend yield on an investor's stock holdings and the relative taxation of dividends.[19]

Strickland (1996) finds that mutual funds and money managers hold low-dividend yield portfolios of stock, while untaxed institutions such as pension funds show no preference.[20] Dhaliwal, Erickson, and Trezevant (1999) find that the percentage of shares owned by institutional investors increases by about 600 basis points in the year after a firm initiates paying a dividend.[21] 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 individuals as their largest shareholder decrease (increase) dividend payout. Poterba and Summers (1985) find a similar result for aggregate dividend behavior in the U.K. from 1950-1983.

Allen and Michaely (1995) point out that the volume of trades around ex-day provides evidence about whether clienteles are static (in the sense 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 on the ex-day. Grundy (1985), Lakonoshok and Vermaelen (1986), and Michaely and Vila (1995) find evidence of abnormal trading volume on the ex-day, which is consistent with dynamic tax-related trading on the ex-day. However, Koski and Michaely (2000) find that abnormal volume can be quite large on ex-days due to non-tax 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 ex-day.

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[19]Allen and Michaely (2001) show that the portion of dividend disbursements received by individual investors has declined from about 60% in the 1980s to one-third in the 1990s.

[20]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.

[21]In addition to relatively low dividend taxation for institutions (relative to individuals), Allen, Bernardo, and Welch (2000) assume that institutions have great incentive to become informed about corporate activities (because of their large stake and perhaps to monitor). Allen et al. model a situation in which high-quality firms use dividends to signal their favorable prospects by attracting a clientele of institutional investors.

Dividend yield and stock returns: Assuming that dividends are taxed at a higher rate than are capital gains, Brennan's (1970) CAPM implies that stocks with higher dividend payments should have a higher return than stocks with return based primarily on capital gains. Black and Scholes (1974) do not support this implication because the dividend-yield variable they add to the market model is not significant. In contrast, Litzenberger and Ramaswamy (1979) find a significant, positive dividend-yield coefficient. Kalay and Michaely (2000) emphasize that Brennan's (1970) implication 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 allowing high-dividend yield firms to be considered zero-dividend in non-dividend 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-day week.

Dividends and firm value: The most common way to determine whether dividends and taxes affect firm value is to regress long-run or ex-day returns on dividend variables (as just described). Fama and French (1998) follow another approach by regressing (changes in) firm value on (changes in) dividends and "firm value if no dividends" (analogous to Equation (2)). 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 (1998) find a positive coefficient, which probably occurs because either their proxy for "firm value if no dividends" is measured with error and/or non-tax 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. This is 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.

Ex-day returns: The reduction in stock price that occurs when stocks go ex-dividend provides an opportunity to examine the effects of personal taxation and dividend clienteles on share value. If dividends are not taxed and markets are perfect, paying a $1 dividend should lead to a $1 reduction in stock price. If

equity is taxed and markets are otherwise perfect, Elton and Gruber (1970) show that the ratio of the price reduction to dividend payment equals $(1-\tau_{dividends})/(1-\tau_{capital\ gains})$. Elton and Gruber find that this ratio 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.[22] Moreover, the ratio ranges 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 the lowest (highest) dividend-yield stocks. On the surface, 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 ratio of price decline to dividend payment was 1.0 in the early 1900s, before the advent of personal income taxes.

There are several complications related to interpreting the ex-day phenomenon. Kalay (1982) points out that absent transactions costs, arbitrage by tax-free investors should push the ratio to 1.0. Kalay argues that transactions 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 transactions costs and the effect of institutional traders; however, Kalay does not explain why the mean ratio differs from 1.0. Michaely (1991) notes another complication of interpreting the Elton and Gruber ratio. Michaely finds that the mean ratio equals approximately 1.0 in both 1986 (when capital gains tax rates were much lower than dividend tax rates for wealthy individual investors) and in 1987-88 (when statutory dividend and capital gains tax rates were nearly equal), and is 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 be set by institutional investors.[23]

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

[22]Rather than using averages, Boyd and Jagannathan (1994) regress price drop on dividend payment and find a slope coefficient of one and a negative intercept. They interpret the negative intercept as a measure of transactions costs.

[23]This discussion ignores the effect of risk (see Michaely and Vila (1995)) and transactions costs (see Michaely and Vila (1996) and Michaely, Vila, and Wang (1997)) on ex-day behavior.

implies a ratio of price reduction to dividend paid 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 the abnormal volume on the ex day (Michaely and Vila (1995)).

Frank and Jaganathan (1998) argue that dividends are a nuisance, and that market makers are well-situated to handle the collection and reinvestment of dividends. 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 hassle remains 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 amount due to supply and demand on the ex-date. They find evidence consistent with their arguments on the Hong Kong exchange, where the average price drop during 1980-1993 is half the average dividend, even though dividends and capital gains are not taxed at the personal level. Kadapakkam (2000) strengthens this argument by showing that when the hassle of handling dividends (i.e., cumbersome physical settlement procedures) was greatly reduced after the advent of electronic settlement, the ratio of price change to dividend in Hong Kong became indistinguishable from 1.0.

In the face of these qualifications, the Elton and Gruber evidence of the effects of personal taxes is hard to interpret. 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 proportional 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 or 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

declines 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.

Finally, McDonald (2002) examines ex-day behavior in Germany, where a tax credit for corporate taxes paid on the income that generated the dividends was attached to most dividend payments (until this feature was repealed in October 2000). This tax credit means that dividends provide German investors with more value than just the cash dividend received. McDonald shows that tax considerations imply that a 1 DM dividend payment should lead to a stock price reduction of 1.43 DM. In his empirical work, McDonald finds that the average price drop is 1.26 DM, indicating that about 60% of the dividend tax credit is impounded in the ex-day price drop. 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 cum-dividend just before ex-day.

Overall, some of the ex-day papers provide clear evidence that personal taxes affect asset prices when dividends are paid.[24] In other papers the evidence is ambiguous about tax effects in the sense that the papers introduce non-tax 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, perhaps because the marginal investor is tax-free. (However, even in cases where tax rates do not appear to affect stock returns directly, taxes might still affect financial markets if they cause increased volume.) The ex-day findings 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. As mentioned above, understanding the tax characteristics of the marginal price-setter(s) in various securities is an important issue for future research.

[24]If a $1 dividend payment reduces stock prices by less than $1 due to investors taxes on dividends, this is direct evidence against the "new view" mentioned in the "personal taxes and stock prices" portion of Section 1.3.

4. Taxes, Organizational Form, and Corporate Restructuring

4.1 Corporation Versus Partnership Form

When an entity operates as a common "C Corporation," revenues returned to investors as equity are taxed at both the firm and investor levels. The firm level taxation is at the corporate income tax rate, and the investor taxation is at the personal equity tax rate. The equity rate is often relatively low because equity income can be deferred or taxed at the relatively low capital gains rate. In contrast, partnership income is passed-through and taxed only at the investor level, at ordinary income tax rates. The tax burden is often disadvantageous to corporate form. For example, at current maximum statutory federal tax rates (Figure 1), an investor would receive $0.604 in partnership income; in contrast, corporate equity payments would return only approximately $0.52 (assuming equity is taxed at a 20% capital gains tax rate). There are, however, nontax benefits to corporate form that outweigh the tax costs for many firms. Gordon and MacKie-Mason (1994) argue that these nontax benefits are large, annually equaling about 4% of equity value. See Scholes et al. (2002) and Gordon and MacKie-Mason (1997) 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.

Research centered on tax reforms has linked taxes with organizational form. 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; these 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. Finally, Guenther (1992) investigates how corporations responded to the 1981 Economic Recovery Tax Act reduction in personal income tax rates, which increased the tax disadvantage for corporations. He finds that firms altered policies that contribute to the corporate double taxation of equity payouts: firms reduced dividends and instead returned capital by increasing the use of debt, share repurchases, and payments in mergers (which are often taxed as capital gains).

Ayers, Cloyd, and Robinson (1996) study small firms and find that entities choose to operate as S-

corps, rather than C-corps, when they experience losses in their early years of operation. These losses can immediately be passed through to S-corp investors, while C-corps must carry losses forward to offset future corporate income. The experiment of studying small firms is especially telling because small firms can generally choose between S- or C-corp form with little difference in cost or nontax considerations; therefore, the choice highlights tax incentives. Interpreting this result as strong tax evidence is somewhat clouded, however, because Ayers et al. do not find that the choice between C-corp and proprietorship/partnership form is affected by tax losses (though nontax considerations can affect this choice). Erickson and Wang (2002) argue that S-corps can be sold for more than C-corps because of favorable tax treatment. Finally, Hodder, McAnally, and Weaver (2001) conclude that banks convert to S-corp status to eliminate double taxation of dividends and to reduce the onerous burden of the AMT.

Research investigating organizational form choices using micro firm- and owner-specific tax information would be helpful. Such papers would most likely require accessing confidential tax returns.

4.2 Mergers, Acquisitions, and Restructurings

Tax incentives can affect the purchase and sale of physical assets. Scholes and Wolfson (1990) describe tax incentives that encouraged merger and acquisition activity in the early 1980s (following the 1981 tax act) and discouraged these activities after TRA86. They provide aggregate evidence that M&A activity surged in the early 1980s, and declined in 1987, consistent with tax incentives. See Scholes et al. (2002) for details of how acquisitions vary along the tax dimension depending on whether the deal involves C- or S-corporations, subsidiaries, spin-offs, carve-outs, etc.

A collection of papers investigate whether seller or buyer tax characteristics affect the structure of deals. Alford and Berger (1998) show that firms trade-off tax and nontax considerations when choosing between spinoffs and asset sales. Spinoffs are preferred by high tax rate firms when they are shedding assets that lead to a taxable gain because spinoffs can be structured to avoid taxes to both the seller and buyer. In contrast, all else equal, sales are preferred when the transaction results in a loss because this loss can be deducted against corporate income. Alford and Berger use estimated tax benefits as a means of determining the size and nature of nontax costs and argue that adverse selection, moral hazard, and agency costs can all affect whether firms pursue tax benefits. 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 so that there is a step-up in subsidiary basis, so that the acquiring firm receives additional depreciation tax benefits. Thus, contrary to a Modigliani and Miller prefect markets prediction, tax considerations affect both the pricing and structure of asset sales.

While taxes appear to affect the structure and price of some deals, the tax-minimizing form is not always selected. Hand and Skantz (1998) argue that issuing new shares in equity carve-outs can avoid tax liabilities that occur when a firm issues secondary shares (at a price above the firm's tax basis in the shares). The authors determine that, relative to issuing new shares, secondary carve-outs increase tax liabilities by an amount equal to 11% of the carve-out IPO proceeds. Hand and Skantz are not able to identify benefits associated with secondary carve-outs that are large enough to offset the increased tax payment. Maydew, Schipper, and Vincent (1999) find that incremental taxes incurred when firms perform taxable sales (rather than tax-free spinoffs) amount to 8% of the value of divested assets. The authors argue that firms incur these tax costs 1) because they are smaller than the financial reporting benefits (e.g., larger financial statement earnings), and 2) when selling firms are cash-constrained (sales provide a cash inflow; swaps do not).

Kaplan (1989) and others have investigated tax benefits in leveraged buyouts. 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 can not 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 target shareholders. Graham (2000) accounts for the declining marginal benefit of incremental interest deductions and estimates that the gross tax benefit of debt equaled approximately one-fourth of firm value in the mid-1980s RJR Nabisco and Safeway LBOs. Finally, Kaplan estimates that among firms electing to step up asset value, the incremental

depreciation tax benefit equaled 28% of the premium.

4.3 R&D Partnerships

Leasing allows a low-tax-rate firm to "sell" tax deductions to high-tax-rate lessors. Analogously, research and development limited partnerships (RDLPs) allow low-tax firms to sell start-up costs and losses to high-tax-rate investing partners. Shevlin (1987) investigates whether firms that perform R&D via partnerships have lower tax rates than firms that do R&D in-house. Two notable features of Shevlin's careful experimental design are his use of simulated tax rates, and his specification of many explanatory variables in "as-if" form (i.e., defining right-hand-side variables for all firms as if they funded R&D in-house, to avoid the endogenous choice of in-house versus RDLP possibly affecting the variables' values). Shevlin finds that tax rates exert a significant, negative influence on the probability of choosing an RDLP in two out of three as-if regressions. Using an NOL dummy to measure tax incentives, Beatty, Berger, and Magliolo (1995) find that low-tax firms are more likely to finance R&D via a financing organization both before and after TRA86.

The Research and Experimentation Tax Credit has also influenced corporate R&D spending. In his economically-weighted regressions, Berger (1993) finds a positive market reaction to announcements affirming the tax credit. His regression coefficients indicate that three-fourths of the benefit of the credit accrues to shareholders, with the remaining one-fourth increasing product price and therefore flowing to employees or suppliers. This latter finding implies that the tax credit creates an implicit tax in the form of higher prices for tax-favored R&D activity and that this implicit tax offsets some of the intended benefit from the credit (in other words, some of the R&D tax credit is passed along in the form of higher prices to suppliers of R&D inputs). Berger also detects a negative market reaction among firms that do not use the credit themselves but compete with firms that do. Swenson (1992) finds evidence consistent with low-tax-rate firms pursuing firm-specific R&D tax credits less aggressively than high-tax-rate firms.

Overall, this research indicates that tax considerations affect the structure and pricing of research and development activity in the United States. The cited papers investigate R&D spending associated with pre-TRA86 tax rules. I am unaware of any similar research that investigates the influence of the tax credit on R&D activity based on post-TRA86 rules (under which the credit is based on the R&D-to-sales ratio, rather than on nominal R&D spending). Moreover, the R&D tax credit has temporarily expired several times

since 1986. It would be interesting to know whether these expirations have affected real R&D activity.

5. Taxes and Compensation Policy

Scholes et al. (2002) argue that to understand tax implications, one needs to consider tax and nontax features for all parties involved in a transaction. This viewpoint is particularly helpful when considering compensation policy, in terms of considering tax implications for both the employer and employee, and also in terms of separating out taxation and incentive effects. In this section, I focus on an issue of interest to finance researchers: employee compensation involving incentive stock option (ISO) and nonqualified option (NQO) plans. (ISOs are also called qualified stock options.) These two forms of incentive pay are similar in most ways other than tax treatment.

ISOs and NQOs are usually granted with an expiration date five to ten years hence and an exercise price equal to the stock price on the day of the grant. Like any option, the employee receives a share of stock upon exercise, which provides a pre-tax benefit equal to the amount by which the stock price exceeds the exercise price.[25] With ISOs, the firm never gets a tax deduction, and the employee pays capital gains tax on the amount the share price exceeds the grant price when the share of stock is eventually sold (assuming that the option is exercised at least 12 months after grant and that 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. When the share of stock is eventually sold (assuming that the share is sold at least 12 months after exercise), the employee pays capital gains tax on the amount the sale price exceeds the price at exercise.

The tax trade-off between ISOs and NQOs amounts to comparing the relatively light burden of capital gains tax treatment for ISOs to the net NQO benefit (i.e., the NQO corporate deduction less the cost to the employee of paying taxes sooner and at a higher rate with NQOs). When the corporation is taxed at a higher rate than the employee on ordinary income, NQOs often minimize the "all parties" taxation of option

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

compensation. ISOs are generally preferred if the corporation has a low tax rate relative to its employees.

Several papers investigate whether corporate and employee tax status affect the choice between ISO and NQO option plans. Austin, Gaver, and Gaver (1998) assume that all 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.

Hall and Liebman (2000) examine CEO compensation. They assume that all firms are subject to the top statutory tax rate and find some evidence that the use of options increased as the corporate tax rate declined from the 1970s to the 1980s. This is consistent with a tax prediction that the tax benefit of options declines with the corporate tax rate because of the forgone opportunity to deduct salary expense immediately. However, when they allow for cross-sectional differences in tax rates, this result weakens. Moreover, when they also add annual dummies (to control for the fact that their first result might occur because the reduction in statutory corporate tax rates proxies for a nontax factor), their tax coefficient becomes insignificant.[26]

In contrast, Core and Guay (2001) examine stock-option plans for employees other than the top five executives. Non-executives hold two-thirds of outstanding compensation options, on average. Core and Guay find that high tax rate firms grant fewer options, consistent with the tax prediction outlined above; they do not find evidence that low-tax rate firms grant more options. Finally, Klassen and Mawani (2000) note that option compensation is not deductible for Canadian corporations and find that the use of options decreases with the corporate marginal tax rate. This is consistent with the tax incentive to use options declining with the opportunity cost of forgoing salary expense deductions.

Consistent with personal tax incentives, Huddart (1998) finds that some employees accelerated NQO option exercise in 1992, prior to the anticipated 1993 increase in upper income personal tax rates (from 31% to 39.6%); however, he concludes that only one-in-five employees took this action, indicating that nontax

[26]Hall and Liebman (2000) find evidence of a small reduction in salaries in response to the 1993 tax rule that eliminates the deductibility of salary in excess of $1 million; however, they conclude that the salary reduction has been more than offset by increases in option pay. (ISO/NQO pay is not included under the cap on salary deductibility because these plans qualify for the “performance related”exemption.)

factors more than offset personal tax incentives in many situations. Goolsbee (1999) finds that in aggregate an abnormally large number of options were exercised in 1992, prior to the tax increase. Hall and Liebman (2000) note that Goolsbee defines abnormal based on a linear trend in exercise activity. When they instead consider the number of vested options and recent changes in stock prices, Hall and Liebman do not find that employees accelerated options exercise in anticipation the personal tax rate increase; nor do they find a delay in exercise in anticipation of personal tax rate reductions in the 1981 and 1986 tax acts.

Matsunga, Shevlin, and Shores (1992) conclude that tax factors affect the disqualification of ISOs. An ISO plan is disqualified (i.e., treated as an NQO plan for tax purposes) if an employee sells her stock less than 12 months after exercising incentive stock options. A company might want to disqualify an ISO plan to receive the corporate deduction associated with NQOs if the corporate tax rate increases relative to the personal tax rate and/or if the ordinary personal rate falls relative to the capital gains tax rate, both of which happened after the 1986 tax reform. Matsunga et al. perform a careful "all parties" tax analysis and conclude that firms with the largest net benefit of disqualification were the firms most likely to disqualify.

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 accounts 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., NY Times, June 13, 2000). It is possible that one reason for the preponderance of "non-results" is that most papers do not consider how compensation deductions interact with the overall pursuit of corporate tax deductions, and in this sense do not consider "all parties." For example, the expectation of future compensation deductions might displace interest deductions, and this could explain why firms appear to use debt conservatively (as discussed in Section 1.4).[27]

New evidence about option compensation tax deductions:[28] Financial statement footnote information

[27]Mozes and Raymer (2000) argue that a firm can hedge employee stock options by issuing debt and repurchasing shares. This results in a tax deduction for the company that reduces the cost of stock option plans. Mozes and Raymer find empirically that employee stock option activity is positively related to share repurchases and leverage increases.

[28]I thank Bob McDonald for making me aware of the corporate tax deductibility of employee stock options. Contemporaneous to this paper, Hanlon and Shevlin (2001) present evidence about options deductions for NASDAQ 100 firms. Hanlon and Shevlin provide an excellent summary of the accounting issues related to options deductions.

can help us understand whether the magnitude of option compensation deductions is sufficient to affect overall corporate tax planning and also to determine whether these deductions are inversely correlated with interest deductions (and therefore might explain why some firms use little debt). I gather information on the exercise and grant prices for all options exercised from 1996 to 1998 by employees of Fortune 500 firms (see Table 5). Assuming that all of the options are nonqualified implies that the corporate options deduction equals the difference between the exercise and grant prices of the exercised options. Note that these deductions appear on tax returns and reduce taxes owed to the government; they do not appear as a deduction on financial statements[29], nor are they collected by Compustat. One could multiply these deductions by J_C to estimate their tax value.

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 5). These numbers are skewed: the firm at the 90th (95th) percentile had $185 ($379) million in deductions. As a percentage of financial statement tax expense, the deductions average 50%. As a percentage of the amount of interest it would take to lever a firm up until there are declining benefits associated with incremental deductions (i.e., levering up to the kink in the Graham (2000) benefit function), the option deductions average 49%. Panel B of Table 5 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, options deductions are larger than tax expense for Intel, GM, and Circuit City.

Overall, the magnitude of the compensation deductions are large for some firms; however, they are moderate for many companies and therefore do not appear to provide the final answer to the puzzle of why some firms appear to be underlevered. Nonetheless, Panel C of Table 5 reveals that compensation deductions appear to substitute for interest deductions, and so at least partially address the puzzle. The Pearson (Spearman) correlation coefficient between the magnitude of option deductions and the degree to which a firm appears to be underlevered (as measured by amount of interest it would take to lever up to the kink in

[29]Option deductions do not reduce financial statement tax expense because the deductions are not treated as a permanent expense. Instead, the deductions are added to stockholders' equity.

the benefit function) is 0.33 (0.46).[30]

Even if options deductions do not entirely solve the underleverage puzzle, this analysis suggests that perhaps there are other deductions (that do not appear on financial statements) that might substitute for interest deductions. One "secretive" source of such deductions is tax shelters, to which I turn next. In general, it would be helpful if future research quantifies the magnitude of deductions that are not commonly included in financial statement-based research.

6. Tax Shelters

Tax shelters offer a means of reducing taxes that may displace traditional sources of corporate tax deductions. Three common characteristics of shelters are that they reduce tax liability without greatly altering financial statement information, they are shrouded in secrecy, and they are often shut down once detected by the Treasury. Tax shelters can take many different forms, and the current "hot product" is always evolving. They usually exploit glitches in the tax system such as asymmetric domestic and foreign tax treatment or a situation in which income is allocated beyond economic income. In the short-run, before detection, shelters can create a money pump, with benefits far exceeding transactions costs and the probability-weighted cost of audit/detection. One could imagine a long-run equilibrium in which the benefits of shelters are competed away or greatly reduced but, as a class, their secretive nature and the proliferation of new products appears to make "short-run" benefits continue unabated for those who participate.

One type of shelter, the high-basis low-value variety, involves a zero-tax foreign investor and a taxable domestic corporation both participating in a deal. The zero-tax investor is allocated a large portion of the income from the deal and then exits the transaction in a manner that leaves a large economic loss. The corporation can deduct the loss against taxable income. To get a feel for the magnitude of the benefit, Bankman (1999) presents an example in which the corporation contributes $11 million to a deal and receives $10 million in property and a $40 million deductible loss. Therefore, the company effectively pays $1 million

[30]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 plan their capital structure. Nor do I distinguish between ISOs and NQOs, although Hall and Liebman (2000) note that NQOs account for 95% of option grants. Future research should address these issues.

(plus maybe $3 million in transactions costs and a small expected cost of being caught) for a tax benefit of $\$40\tau_C$ million.

Some forms of shelters, such as the tax deductible preferred stock (MIPS) discussed in Section 1, receive positive rulings from the Treasury and go on to become accepted financial transactions. Further discussion of tax shelters is beyond the scope of this paper. The interested reader is directed towards Bankman (1999), the source for much of the tax shelter discussion in this section.

7. Conclusion and Suggestions for Future Research

This paper reviews research related to how taxes affect corporate activities. The research often finds that taxes affect corporate decisions – but the magnitude of the effect is not always large. The paper also cites numerous areas that deserve further attention. It would be helpful if future research could provide

- time-series evidence about whether firm-specific changes in tax status affect debt policy,
- robust statistical treatment of tax coefficient standard errors,
- capital structure comparisons of classical versus imputation tax systems,
- market evidence about the importance personal taxes affecting asset prices,
- market evidence on the effective equity tax rate for the marginal investor,
- information related to the identity of the marginal investor between different securities,
- evidence about the market value of the tax benefits of debt for the broad cross-section of firms (i.e., beyond the MIPS analysis),
- explanations for the apparently conservative debt policy of many firms,
- experiments using relatively sophisticated tax variables and considering potential endoegneity,
- "clean" ex-day studies like Green and Rydqvist (1999) that isolate tax effects,
- direct tests of multinational tax incentives, including the interaction of explanatory variables when appropriate,
- additional multinational tests beyond those focusing on incentives from rows (4) and (5) of Table 3,
- tests considering the substitution of accumulated or current FTCs for other tax deductions,
- analysis that measures excess (or deficit) credit tax position with more than just current-period average tax rates,
- "all parties, all deductions" consideration of the interaction of compensation and other deductions,
- compensation tests using firm- and employee-specific tax rates,
- analysis of whether taxes affect the pricing and structure of lease (or other financial) contracts,
- evidence about the choice of corporate form using firm-specific data,
- analysis of whether non-debt tax deductions (especially those that do not appear on financial statements) might substitute for interest deductions, and help solve the "underlevered puzzle", and
- emphasis on the economic importance of tax effects, in light of Myers (Myers et al. (1998)) statement that taxes are of third-order importance in the hierarchy of corporate decisions.

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Table 1 – appears at the beginning of the paper

Table 2
Annual calculations of the mean benefits of debt and degree of debt conservatism

Before-financing MTR is the mean Graham (1996) simulated corporate marginal tax rate based on earnings before interest deductions, and *after-financing MTR* is the same based on earnings after interest deductions. *Kink* is the multiple by which interest payments could increase without a firm experiencing reduced marginal benefit on incremental deductions (i.e.,the amount of interest at the point at which a firm's marginal benefit function becomes downward sloping, divided by actual interest expense) as in Graham (2000). The *tax benefit of debt* is the reduction in corporate and state tax liabilities occurring because interest expense is tax deductible, expressed as a percentage of firm value. *Money left on the table* is the additional tax benefit that could be obtained, ignoring all costs, if firms with kink greater than one increased their interest deductions in proportion with kink.

	Before-financing MTR	After-financing MTR	Kink	Tax benefit of debt	Money left on table
1980	0.415	0.324	3.10	10.1	27.7
1981	0.413	0.319	2.98	11.4	28.6
1982	0.397	0.286	2.69	11.0	23.2
1983	0.388	0.282	2.68	10.7	22.5
1984	0.380	0.275	2.75	10.9	21.6
1985	0.366	0.255	2.51	11.1	21.8
1986	0.356	0.241	2.39	11.6	20.5
1987	0.296	0.198	2.35	10.7	19.5
1988	0.259	0.172	2.30	9.9	16.7
1989	0.258	0.169	2.24	10.6	15.8
1990	0.258	0.164	2.08	10.7	15.3
1991	0.257	0.160	1.99	9.6	11.7
1992	0.258	0.165	2.07	8.7	9.7
1993	0.236	0.175	1.71	7.7	8.0
1994	0.249	0.183	1.94	7.3	8.5
1995	0.260	0.207	1.99	7.8	9.8
1996	0.261	0.185	2.05	9.8	12.2
1997	0.261	0.188	2.08	9.1	10.9
1998	0.252	0.165	2.00	9.5	10.7
1999	0.252	0.170	1.90	7.7	8.9

Table 3
Tax incentive to use debt in a U.S. multinational firm with foreign tax credits and allocable domestic interest

Assume that a U.S. multinational firm currently returns $1 of pre-corporate-tax earnings to its marginal investor as domestic equity. The one-period model in this table shows the tax effect of instead returning the $1 as foreign interest (rightmost column in each panel below) or as $1 of domestic interest (the second-to-rightmost column). The model is adapted from Collins and Shackelford (1992) and assumes that all foreign income (Inc_{For}) is repatriated every year and that tax rules are the same worldwide, except that only the U.S. allocates interest. The model ignores the AMT, carrybacks and carryforwards, personal taxes, and allocable items other than interest. Because the real-world tax-code is dynamic (i.e., allows for carrybacks and carryforwards), the one-period nature of this model might overstate (understate) the largest (smallest) tax benefits. Note that foreign losses (i.e., $Inc_{For} - Int_{For} < 0$) can not be repatriated as losses back to the U.S. FTC_{allow} is allowable foreign tax credit (sometimes referred to as $FTC_{limitation}$, FA is foreign assets net of foreign debt, WA is worldwide assets net of foreign debt, and FSI is foreign source income, which equals $Inc_{For} - Int_{For} - \frac{FA}{WA} Int_{US}$.

$Tax_{World} = Tax_{US} + Tax_{For} - FTC_{allow} = (Inc_{US} - Int_{US} + Inc_{For} - Int_{For})\mathbf{J}_{US} + (Inc_{For} - Int_{For})\mathbf{J}_{For} - FTC_{allow}$, where

$FTC_{allow} = Max\{0, Min [Tax_{For}, FSI\mathbf{J}_{US}, Tax_{US}] \} = Max\{0, Min [(Inc_{For} - Int_{For})\mathbf{J}_{For}, (Inc_{For} - Int_{For} - \frac{FA}{WA} Int_{US})\mathbf{J}_{US}, (Inc_{US} - Int_{US} + Inc_{For} - Int_{For})\mathbf{J}_{US}]\}$

	If Tax_{US}	and Tax_{For}	then FTC_{allow}=	and Tax_{World} =	$\delta(Tax_{World}) / \delta(Int_{US})$	$\delta(Tax_{World}) / \delta(Int_{For})$
(1)	=0	>0	0 *	$(Inc_{For} - Int_{For})\mathbf{J}_{For}$	0	$-\mathbf{J}_{For}$
(2)	>0	=0	0	$(Inc_{US} - Int_{US})\mathbf{J}_{US}$	$-\mathbf{J}_{US}$	0
(3)	=0	=0	0	0	0	0

Otherwise, if $Tax_{US}>0$ and $Tax_{For}>0$ and

	if Inc_{US}-Int_{US}	and $\mathbf{J}_{US}$	then FTC_{allow} =	referred to as	$\delta(Tax_{World}) / \delta(Int_{US})$	$\delta(Tax_{World}) / \delta(Int_{For})$
(4)	>0	> Tax_{For} /FSI	$(Inc_{For} - Int_{For})\mathbf{J}_{For}$	deficit credit	$-\mathbf{J}_{US}$	$-\mathbf{J}_{US} -\mathbf{J}_{For} + \mathbf{J}_{For} = -\mathbf{J}_{US}$
(5)	>0	< $\mathbf{J}_{For}$	$(Inc_{For} - Int_{For} - \frac{FA}{WA} Int_{US})\mathbf{J}_{US}$	excess credit *	$-\mathbf{J}_{US} (1 - \frac{FA}{WA})$	$-\mathbf{J}_{US} -\mathbf{J}_{For} + \mathbf{J}_{US} = -\mathbf{J}_{For}$
(6)	<0, abs. val < Inc_{For} - Int_{For}	not applicable	$(Inc_{US} - Int_{US} + Inc_{For} - Int_{For})\mathbf{J}_{US}$	domestic losses but worldwide profits (excess credit) *	0	$-\mathbf{J}_{US} -\mathbf{J}_{For} + \mathbf{J}_{US} = -\mathbf{J}_{For}$

*In a multi-period model, FTCs above the allowable amount could be carried back or accumulated and carried forward. For example, in the excess credit case with interest allocation (row (5)), $\frac{FA}{WA}$ of unused FTCs accumulate per incremental dollar of domestic interest.

Table 4
Summary of predictions and empirical evidence for multinational capital structure

Prediction	Empirical Evidence
Firm uses less debt when it has accumulated FTCs	None
Excess credit firms should have less incentive than deficit credit firms to use domestic debt. The incentive for excess credit firms to use domestic debt declines with the proportion of assets that are foreign. The incentive to use foreign debt increases in the foreign tax rate.	Debt usage declines when firm is excess credit. The reduction is increasing in the fraction of assets that are foreign (Froot and Hines (1995)). Likelihood of issuing domestic debt is highest when deficit credit and decreases as FTC limitations increase (Newberry (1998) and Newberry and Dhaliwal (2000)). Excess credit firms' use of foreign debt increases in J_{For} and in the share of foreign assets (Altshuler and Mintz (1995)). Debt ratios of foreign affiliates increase in J_{For} (Desai (1997) and Altshuler and Grubert (2000))
If domestic losses, use foreign debt.	U.S. multinationals borrow in foreign subsidiary when they have domestic NOL carryforwards (Newberry and Dhaliwal (2000)).
Use a different financing source than domestic debt, especially when foreign assets are substantial. For example, use leases instead of debt because lease payments are not allocated to foreign operations.	Weak evidence that excess credit firms lease more than other firms (Froot and Hines (1995)). U.S. firms' incentive to finance with preferred stock rather than debt increases with proportion foreign assets (Collins and Shackelford, 1992) and Newberry (1998)).
Use internal debt infusion rather than internal equity to finance foreign subsidiary, especially when J_{For} is high. Similarly, finance via royalty agreement rather than with equity.	Net internal borrowing by subsidiary from parent increases in J_{For} (Desai (1997)). Increase royalty payments when cheaper than repatriating dividends (Hines, 1995)
Use transfer pricing to increase (decrease) cashflow to low (high) tax affiliate.	Multinationals overinvoice low-tax affiliates (Lall (1973)). Foreign-controlled U.S. firms' U.S. tax expense is inversely related to difference between U.S. and global tax rate (Mills and Newberry (2000)).
Repatriate dividends when excess credit. Repatriation for deficit credit firms negatively related to $J_{US} - J_{For}$. Remit dividends from high- and low-foreign-tax firms simultaneously, to reduce potential domestic taxes.	Excess credit firms repatriate more than deficit credit firms, and repatriation by deficit credit firms is inversely related to the cost of doing so. (Hines and Hubbard (1990)) Most repatriated dividends are "coss-credited"; (Altshuler and Newlon (1994))
Borrow via U.S. subsidiary that is less than 80% owned by multinational parent.	Example: Ford Motor Co. set up domestic financing subsidiary of which it owned 75% (Scholes et al. (2002)).
Use triangle arrangements between subsidiaries in foreign jurisdictions with different tax burdens to reduce domestic taxes owed on remittances.	Low-foreign tax subsidiaries invest in high-tax affiliate subsidiaries, who in turn remit funds to U.S. parent at low or zero domestic tax liability; or low-foreign tax subsidiaries are capitalized by high-tax affiliate subsidiary, so repatriations from high-tax subsidiary are assigned a foreign tax rate that is a mixture of the low and high tax rates (Altshuler and Grubert (2000)).

Table 5
Corporate Tax Deductions Resulting from Option Compensation for fortune 500 firms, 1996-1998

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. *Deduction/interest to kink* is the compensation deduction divided by the amount of interest it would take a firm to lever up to the kink in its marginal benefit of interest function (as calculated in Graham (2000)).

Panel A Fortune 500 1996-1998	Option Deduction ($ million)	Deduction/ Interest Expense	Deduction/ "interest to kink"	Deduction/ Tax Expense
Mean	85.2	9.371	0.489	0.495
25th percentile	3.8	0.030	0.016	0.029
Median	16.1	0.153	0.057	0.097
75th percentile	58.1	0.585	0.171	0.283
90th percentile	184.7	1.800	0.500	0.632
95th percentile	378.6	4.088	1.046	1.136

Panel B Specific Firms	Option Deduction ($million)	Interest Expense ($million)	Tax Expense ($million)	Deduction/ Interest Expense	Deduction/ "interest to kink"	Deduction/ Tax Expense
Dell Comp. (1997)	468.6	3.0	424.0	156.19	19.52	1.11
Intel Corp. (1998)	1185.7	40.0	3069.0	29.64	3.71	0.39
Dollar Gen. (1997)	57.8	3.7	87.2	15.36	3.07	0.66
GM (1998)	157.1	72.8	-44.7	2.16	2.67	-3.51
Circuit City (1998)	27.2	9.1	-15.0	3.00	1.50	-1.81

Panel C Correlations	Interest Expense	Tax Expense	Interest to Kink
Option Deduction (Pearson)	0.247	0.523	0.326
Option Deduction (Spearman)	0.253	0.583	0.458

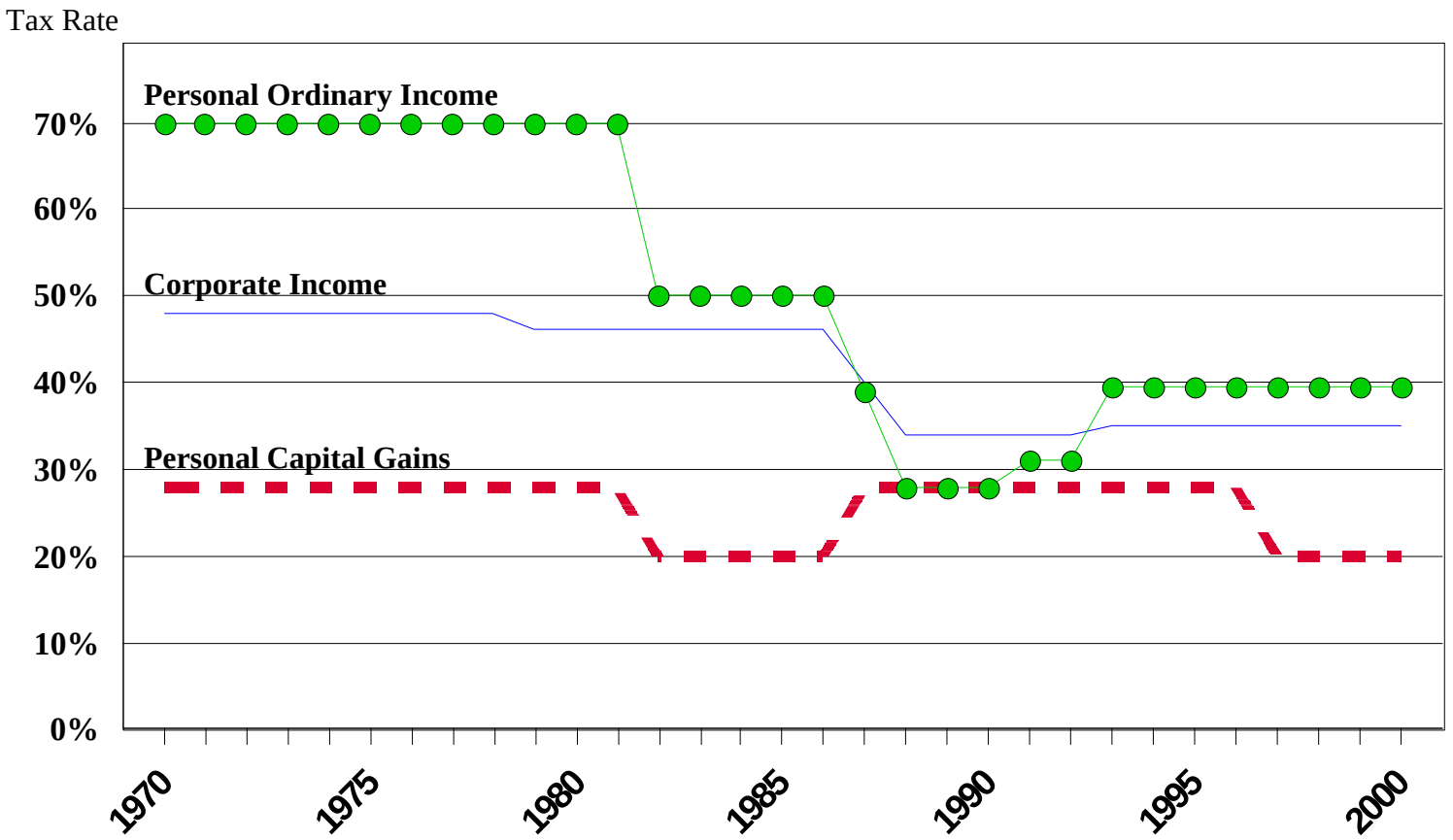

Figure 1

Corporate and Personal Income Tax Rates

The highest tax bracket statutory rates are shown for individuals and C corporations. The C corporation capital gains tax rate was equal to the corporate income tax rate every year after 1987 and equal to 28% every year before 1988.

Debt Supply and Demand Curves

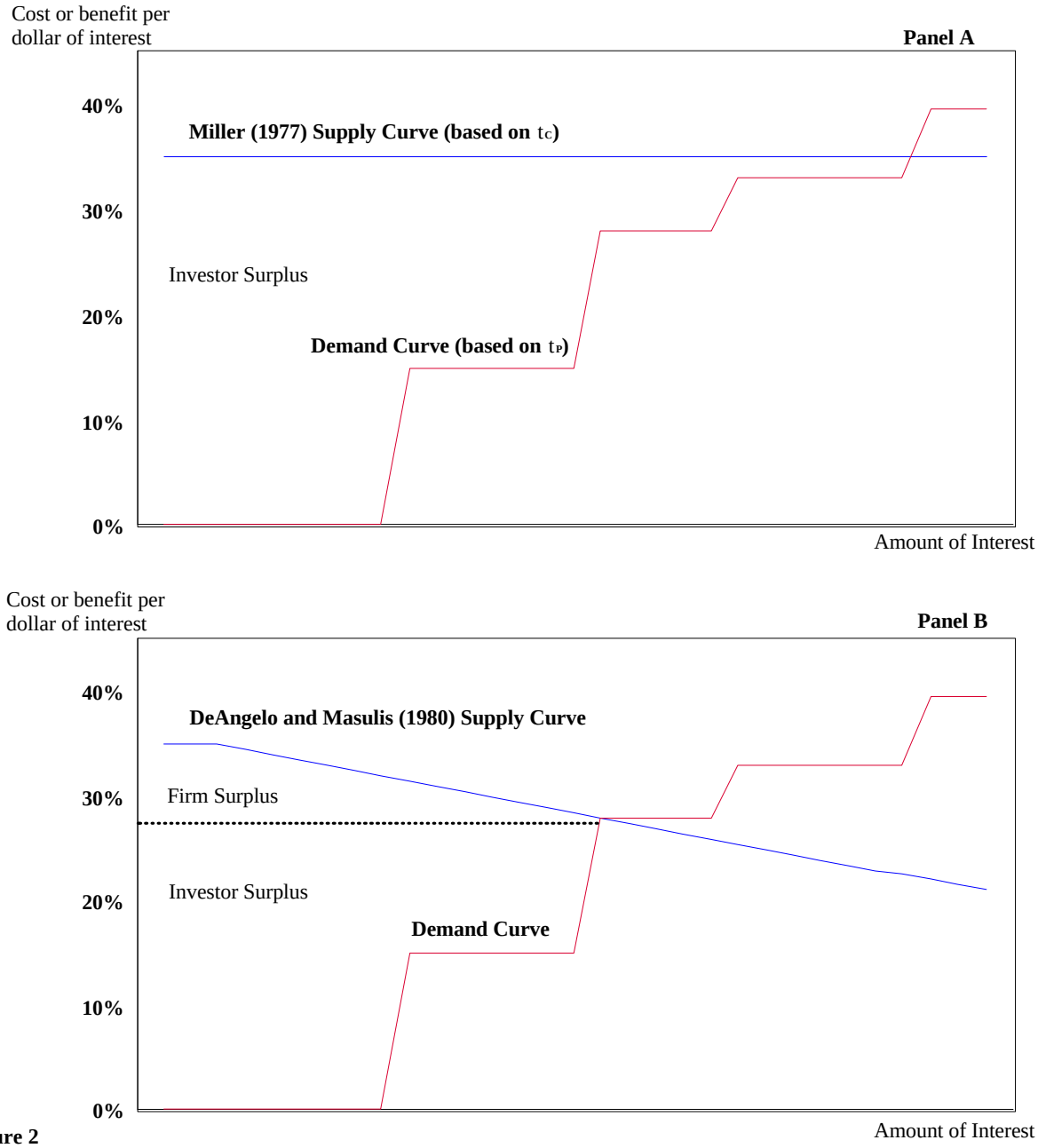

Figure 2

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 rate for the marginal supplier of and investor in debt is 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 deductilibty is larger than the personal tax cost implicit in the debt interest rate.