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Employee Stock Options, Corporate Taxes, and Debt Policy

JOHN R. GRAHAM, MARK H. LANG, and DOUGLAS A. SHACKELFORD*

ABSTRACT

We find that employee stock option deductions lead to large aggregate tax savings for Nasdaq 100 and S&P 100 firms and also affect corporate marginal tax rates. For Nasdaq firms, including the effect of options reduces the estimated median marginal tax rate from 31% to 5%. For S&P firms, in contrast, option deductions do not affect marginal tax rates to a large degree. Our evidence suggests that option deductions are important nondebt tax shields and that option deductions substitute for interest deductions in corporate capital structure decisions, explaining in part why some firms use so little debt.

THIS PAPER EXPLORES the corporate tax implications of compensating employees with nonqualified stock options. Corporations deduct the difference between current market and strike prices when an employee exercises a nonqualified stock option. For option-intensive companies with rising stock prices, this deduction can be very large. We focus on the effects of options on the year 2000 marginal tax rates (MTRs) for Nasdaq 100 and S&P 100 firms and the implications for debt policy.[1]

Understanding the tax implications of options is increasingly important because the proportion of compensation paid in stock options has soared in recent years. A perspective on the magnitude of options compensation and its increase over time can be gained from papers like the one by Desai (2002), who reports that in 2000 the top five officers of the 150 largest U.S. firms received options with grant values exceeding $16 billion, which he estimates is a tenfold increase over the decade. He estimates that proceeds from option exercises averaged 29% of operating cash flows in 2000, up from 10% in 1996. In addition,

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[1] We use a Scholes et al. (2002) MTR that accounts for the present value of current and future tax consequences associated with changes in today's income.

the exercise of these stock options has created large corporate income tax deductions. Sullivan (2002) estimates that the total corporate tax savings from the deduction of stock options jumped from $12 billion in 1997 to $56 billion in 2000.[2] Cipriano, Collins, and Hribar (2001) report that the tax savings from employee stock option deductions for the S&P 100 and the Nasdaq 100 averaged 32% of operating cash flows in 2000, up from 8% in 1997. Sullivan (2002) adds that option tax deductions in 2000 exceeded net income for 8 of the 40 largest U.S. companies (as determined by market capitalization): Microsoft, AOL, Cisco Systems, Amgen, Dell Computer, Sun Microsystems, Qualcomm, and Lucent. Furthermore, options compensation has spread beyond technology stocks. Companies as diverse as General Electric, Pfizer, Citigroup, and IBM deducted over $1 billion in stock option compensation in 2000.

Our analysis confirms that employee stock option deductions substantially reduce corporate tax payments. We estimate that, in 2000, stock options reduce corporate taxable income by approximately $100 billion for our sample of S&P 100 and Nasdaq 100 firms. For the S&P 100 firms, aggregate stock option deductions equal approximately 10% of aggregate pretax income. For the Nasdaq 100 companies (which are more option-intensive), aggregate deductions exceed aggregate pretax income.

This study, however, focuses primarily on the effect of employee stock options on MTRs and the resulting impact on capital structure. MTRs are an important consideration in many economic decisions. In particular, if employee stock options are large enough to affect MTRs, they can reduce the value of interest deductions and alter the incentives to issue debt.

We find that stock option deductions substantially reduce MTRs. For Nasdaq firms, the deductions comprise such a large proportion of preoption income that the median MTR tumbles from 31% when we ignore option deductions to 5% when option deductions are included in the tax rate calculation. For the S&P firms, the median MTR is little affected by option deductions. As described in more detail in Section I, we isolate the effect of three classes of options on the MTR: those already exercised, those granted but not yet exercised, and those yet to be granted. Each class of options contributes to the overall reduction in MTRs.

We then test whether the impact of employee stock options on MTRs affects debt policy. DeAngelo and Masulis (1980) argue that companies substitute between debt and nondebt tax shields (such as option deductions) when determining their optimal capital structure. Previous investigations of this substitution effect were inconclusive (see Graham (2003) for a review). Some papers conclude that high-MTR firms appear to carry insufficient debt in their capital structures. Hanlon and Shevlin (2002), however, point out that these previous studies may fail to detect the expected MTR-debt relation because they ignore tax deductions from stock option exercise.

[2] It is important to note that this amount does not imply a reduction in overall tax revenues, because it fails to take into account the increase in individual tax burdens associated with option exercise. In particular, employees exercising nonqualified options face potential tax obligations for the difference between the market and strike price at the time of exercise.

In our sample, we find that debt ratios and MTRs are not significantly pairwise correlated when we ignore option deductions in the construction of MTRs. In contrast, after adjusting for expected option deductions, the relation between debt and taxes is positive and significant. This result indicates that accounting for the tax deductions associated with stock options provides important incremental power to explain debt policy, which is consistent with managers factoring in the tax effects of options when they select capital structure. Furthermore, when we identify firms that appear to be underlevered when option deductions are ignored, we find that these firms are the ones that use the most options. Overall, our analysis is consistent with firms trading off debt and nondebt tax shields when making capital structure decisions, in the manner suggested by DeAngelo and Masulis (1980). Our results may also provide a partial answer to the puzzle as to why some firms currently use so little debt (Graham (2000))—once option deductions are considered, the MTRs for these firms reflect a small tax incentive to use debt, so their low debt ratios may be appropriate.

Our paper is related to several branches of academic research. The second half of our paper is most similar to Kahle and Shastri (2002), who investigate whether firms with large option deductions use less debt. However, Kahle and Shastri do not consider several issues that we address. First, they do not calculate MTRs or the effect of options on MTRs. These omissions are a shortcoming because option deductions should only affect capital structure decisions to the extent that they affect MTRs. Second, as discussed in more detail later, they measure option deductions with the "tax benefits" number found in the financial statements, rather than using the more accurate information contained in the stock options footnote (Hanlon and Shevlin (2002)). Third, Kahle and Shastri do not account for the effects of options that are already granted but not yet exercised, nor options not yet granted. Finally, Kahle and Shastri do not address the uncertainty of option exercise timing, nor more generally how option deductions interact with the dynamic aspects of the federal income tax code. We provide details in Sections I and II describing how we account for these sometimes subtle influences.

Besides its relation to effective tax rate and capital structure research, this paper is related to two other branches of research. First, a series of papers investigates whether tax incentives play a role in the form of compensation a firm chooses to use. The early research in this area was inconclusive (e.g., Hall and Liebman (2000)); however, recent research by Core and Guay (2001) finds that high tax-rate firms issue fewer stock options to nonexecutive employees, presumably because the firms would rather use traditional forms of compensation that lead to an immediate deduction. Our paper does not investigate whether taxes affect the choice among various forms of compensation, but does suggest that firms consider the tax effects of compensation when deciding on corporate capital structure. In principle, if firms were to shift away from using option compensation to using another form of compensation (e.g., cash compensation or restricted stock) the implication from our paper is that deductions from these alternative forms of compensation would be traded off with debt interest deductions. Second, our paper is related to the literature that investigates how tax managers optimize corporate tax policy (e.g., Scholes et al. (2002)). We contribute to this body of literature by providing evidence consistent with tax managers considering the interaction of various corporate policies when choosing tax positions.[3]

In Section I, we discuss major conceptual issues that arise in assessing the effect of stock options on MTRs and our approach for addressing them. Section II discusses our empirical approach in detail and describes the data. Section III analyzes the effect of option deductions on corporate MTRs. Section IV examines the interaction between option deductions and corporate debt policy. Section V presents closing remarks.

I. Tax Issues Related to Corporate Deductions from Employee Stock Options

The simulation procedure that we use to estimate year 2000 MTRs incorporates dynamic features of the tax code, including tax loss carrybacks and carryforwards (Shevlin (1990) and Graham (1996)). The procedure determines the MTR based on the incremental tax effects associated with an extra dollar of income earned in 2000. The incremental effect of an extra dollar of income in 2000 can be realized anywhere between 1998 (because of the two-year tax loss carryback period) and 2020 (because of the 20-year tax loss carryforward period), or not at all (if losses are sufficient to offset all current and future profits). To model the carryforward effect, we first produce a baseline forecast of the future by forecasting future taxable income (discussed in Section II.B), future grant and exercise behavior (Section II.C), and future stock prices (Section II.D). Starting with the baseline forecast, we estimate the present value tax consequences associated with one additional dollar of income earned in 2000. If, because of carryforwards or carrybacks, the tax consequences occur in 2001 or later, we discount the incremental effect back to year-2000 dollars. In Section II.E, we explore issues related to discounting tax liabilities when a firm has stock option deductions.

To capture uncertainty about the future, we produce 50 random baseline forecasts of the future, each of which produces an estimate of the MTR. The expected MTR is the mean tax rate among these 50 estimates. In the absence of stock options, estimating MTRs is relatively straightforward. One can use the mean implied growth rate and variance from the historic time-series of taxable income (estimated from pretax income adjusted for deferred taxes as described in more detail in the next section) as the seed parameters to produce the 50 random baseline forecasts of the future through 2020. However, the existence of options introduces several important issues into the standard simulation procedure. We discuss these issues in the remainder of this section.

[3] Strictly speaking, our results are consistent with managers trading off interest and option deductions in 2000. In other years, when option deductions are less important, tax planners may accelerate non-option deductions. It would be interesting for future research to investigate whether managers trade off non-option deductions with interest in eras when option deductions are less prominent.

First, one can no longer simply adjust pretax income for deferred taxes to estimate taxable income, because unlike other forms of compensation, stock options are not typically reflected in pretax income or in deferred taxes. In terms of pretax income, options are generally not considered an income statement expense, and firms that opt not to expense stock options also do not reduce tax expense on the income statement to reflect the effect of option deductions.[4] Further, unlike many book/tax differences, the effect of options is not captured in deferred taxes because the difference between tax and book income never reverses. As a result, a firm can consistently report high tax expense (on financial statements) and never pay any taxes (on tax returns). Prior research has typically used income statement data to infer taxable income and thus ignored option compensation deductions for the majority of firms (because most firms do not expense options).

An exception is Kahle and Shastri (2002), who make an adjustment for stock options using reported "tax benefits from stock options" numbers to adjust pretax income.[5] Hanlon and Shevlin (2002) stress that using this approach is problematic for several reasons. First, many firms do not separately report the tax benefit from stock options in their financial statements. Even for the Nasdaq 100, for which stock options benefits are likely to be large, Hanlon and Shevlin note that only 63 companies report the tax benefits from options in their 1999 financial statements. Further, while adjusting pretax income for option tax benefits is relatively straightforward if taxable income is positive, cases with tax losses are more complex because of the effects of net operating loss carryforwards and tax valuation allowances. We avoid these issues by following Hanlon and Shevlin's advice and gathering our option deductions data from the detailed information on grants and exercises found in the financial footnotes. This information is reported consistently across firms irrespective of tax status.

A second unique issue with stock options is that current-period MTRs can be affected by several classes of option deductions: those emanating from already-exercised options (because they affect the current level of taxable income and possibly tax loss carryforwards), as well as those attributed to the overhang of already-granted but not-yet-exercised options and not-yet-granted options (because these classes of options can create losses in the future that affect current-period MTRs via the carryforward and carryback features of the tax code). All the studies of which we are aware only consider one of these

[4] Statement of Financial Accounting Standards (SFAS) 123 permits firms the choice of either expensing stock options on the income statement or disclosing in the footnotes the effect stock options would have had if expensed. In 2000, it was extremely rare for a firm to expense stock options on the income statement, with the vast majority of firms opting for footnote disclosure. If a firm opted not to expense options, it was not permitted to reduce tax expense for the deductions related to option exercise. The underlying logic was that since the original charge did not reduce pretax income, the tax benefit at exercise should not decrease tax expense.

[5] Tax benefits from option deductions are sometimes explicitly reported on two financial statements: the statement of cash flows and the statement of shareholders' equity. However, tax benefits from options are not always reported as a separate line item and instead are often aggregated with another item on these statements.

types of options: already-exercised options. This limitation is acceptable for research examining effective tax burdens, such as Desai (2002), Hanlon and Shevlin (2002), and Sullivan (2002). However, it is important to consider all three classes of options when studying economic decisions based on marginal tax incentives. Options outstanding but not yet exercised, for example, create "deduction overhang" in the sense that firms may find themselves in positions where there are many deep-in-the-money options outstanding that are likely to be exercised in the future, reducing taxable income and (through the carry-back feature of the tax code) current-year MTRs. As a result, two firms that currently grant similar amounts of compensation in options can find themselves in very different MTR positions, depending on past stock price behavior and the number of options that remain unexercised. We use footnote information on options outstanding and past option granting behavior to forecast the likely effects of outstanding options and future option grants on current MTRs.

A third conceptual issue that is unique to stock option research is the uncertainty of if and when not-yet-exercised options will lead to corporate tax deductions. Because share prices are volatile and options have long lives (most often 10 years), currently outstanding options and future option grants can generate huge deductions in the future or no deductions at all, depending on the stock price path. The stochastic nature of stock option deductions can substantially complicate computations of estimated MTRs and consequently any corporate decisions in which taxes are relevant. The stock price path and employee exercise decisions are difficult to predict, and for efficient tax and financial planning, a manager would need to factor in the probabilities and amounts of future option deductions. We explicitly implement a simulation approach for considering stock option deductions using information on stock options, stock return volatility, dividends, and expected returns to modify the Graham (1996) simulation technology. We combine expected deductions with simulated future taxable income to arrive at probability-weighted estimates of MTRs. The analysis is very similar to the approach we envision a corporate manager would undertake to make decisions based on expected MTRs. To our knowledge, ours is the first study to take the ex ante perspective of explicitly incorporating preexercise option information into MTR estimates.

II. Empirical Approach

A. Sample

We study the firms that were in the Standard and Poor's 100 and the Nasdaq 100 on July 17, 2001 (the day we began data collection). They comprise a substantial portion of the economy and pay substantial taxes.[6] Analysis of S&P 100 firms provides insight about traditional and stable industrial firms. The

[6] In 1998, the most recent year for which IRS data are available, the firms in our sample had tax expense equal to more than one-third of the taxes paid for the entire corporate sector.

Nasdaq 100 firms are the most profitable and stable among option-intensive, high-technology firms. Seven firms are in both the Nasdaq and S&P, so the initial sample includes 193 firms. Throughout our MTR analysis, we include these seven firms in the S&P subsample but exclude them from the Nasdaq subsample to avoid double counting. We are unable to locate data for three firms, which reduce the sample to 190 companies.[7] We limit the sample to these 190 firms because (1) hand-collecting stock option data in the financial statement footnotes is costly, and (2) our simulation method is less likely to produce reliable results for small and unstable firms.

We envision a scenario in which a manager assesses his firm's MTR at the end of the fiscal year. Our reference point is the most recent year for which data were available at the inception of this project, which is fiscal year-end 2000 as defined by COMPUSTAT (year-ends from June 2000 through May 2001) for the vast majority of sample firms.[8] Stock prices at year-end 2000 were substantially below market highs, although still above recent market levels, which raises the question of whether the findings in this study are period specific. Because the investigation period follows an extended bull market, managers may not have envisioned the magnitude of the eventual stock option deductions when they granted the options years earlier. Nonetheless, our characterization is representative of the situation firms found themselves in at year-end 2000, with managers facing MTRs similar to those estimated in this study.[9] More generally, the approach that we develop in this study should be useful in any year for incorporating stock option deductions in MTR calculations, whether the option deductions are large or small in a given year.

B. *Estimating Historic and Future Income (Ignoring Option Deductions)*

We implement a variation of the simulation algorithm used in Shevlin (1990) and Graham (1996), which requires a forecast of future income in order to calculate current-year MTRs. Our procedure assumes that income next year equals income this year plus an innovation. The innovation is drawn from a normal distribution, with growth and volatility calculated from firm-specific historic data. Because options do not create a charge to accounting earnings, our COMPUSTAT-based measure of historic pretax earnings, adjusted for deferred

[7] Of the three missing companies, two are foreign companies (Erickson and Checkpoint). The other (JPM) is not listed on Edgar for unspecified reasons.

[8] In the sample, 124 firms have December 2000 year-ends, and 22 have year-ends between September and November 2000. Another 20 have year-ends in 2000 earlier than September, and in eight of these cases we use 1999 data because the year-end is in May (and 10-Ks for fiscal year 2000 were not available when we collected the data). Finally, the remaining 24 companies have year-ends between January and May 31, 2001.

[9] To estimate the effects of the stock market run-up, we perform a robustness check in which we assume that historic stock prices and returns, as well as historic grant and exercise prices, are only half what they actually were. Even with dampened stock prices, the sheer number of options granted and exercised is such that this robustness check produces a mean tax rate that is only modestly higher than the base case tax rate we report below.

taxes, does not include the effect of stock option deductions.[10] By extension, neither do our base forecasts of future income include the effects of option deductions. Additionally, since our data are from financial statements, our measure of taxable income faces the usual limitations when book numbers are used to approximate tax payments, including book-tax differences in consolidation and recognition of foreign profits.[11]

We use COMPUSTAT data from the last 20 years to calculate firm-specific growth and volatility. Some firms have extreme historical earnings information that seems implausible going forward. Therefore, we bound each firm's earnings growth and volatility to fall within their respective 25th and 75th percentiles among all firms in the same 2-digit SIC code.[12] Using these growth rate and volatility estimates, we forecast preoption taxable income for the next 20 years.

C. Including Historic and Future Option Exercises

Since 1996, SFAS 123 has required firms to include in their financial footnotes, among other things, (1) a description of option terms; (2) the number of options, weighted average strike price, and remaining contractual life for options outstanding at the end of the period; (3) three years of exercise, grant, and cancellation history (number of shares and weighted average price); and (4) the Black–Scholes value of options granted during the period, including the underlying assumptions for dividend yield, risk-free rate, annual return volatility, and expected term before exercise.[13] Firms have relatively little discretion

[10] Stock option deductions can show up in our pre-option measure of taxable income if they affect deferred taxes. This should only occur when option deductions contribute to tax loss carryforwards (Hanlon and Shevlin (2002)). Due to data limitations, we are unable to determine the extent to which this occurs in our sample. Therefore, in our main analysis we assume that option deductions do not affect deferred taxes. We also perform an unreported robustness analysis in which we do not adjust income for deferred taxes, thereby guaranteeing that options do not affect our pre-option earnings figure. Relative to the base case results reported below, the mean tax rate is 70 basis points lower in this "no deferred taxes adjustment" analysis, but the qualitative implications are unchanged.

[11] See Plesko (2003) for a comparison of the actual MTR based on the tax return versus estimated tax rates based on financial statement data, such as the simulation tax rate used in this paper. Note that Plesko's analysis ignores potentially important dynamic features of the tax code, such as tax loss carrybacks and carryforwards, by using a static tax return tax rate as the benchmark. Nonetheless, Plesko concludes that of the various tax variables he considers, the simulated tax rate is the most highly correlated with tax return tax rates.

[12] This approach is consistent with the common procedure of using industry inputs when calculating a firm's cost of capital. Note that our qualitative results do not change if we do not bound growth rates or volatility, nor if we set each firm's growth and volatility equal to industry medians.

[13] Specifically, SFAS 123 states that "the fair value of a stock option (or its equivalent) granted by a public entity shall be estimated using an option-pricing model (for example, the Black–Scholes or a binomial model) that takes into account as of the grant date the exercise price and expected life of the option, the current price of the underlying stock and its expected volatility, expected dividends on the stock . . . , and the risk-free interest rate for the expected term of the option." Appendix B of SFAS 123 provides detailed guidance on estimating the inputs into the valuation formula, and firms are required to disclose the assumptions used in valuation.

in their Black–Scholes assumptions, and the footnote format is generally consistent across firms. For those firms with unusual disclosures, our results are robust to their exclusion.[14] For illustrative purposes, the appendix includes Microsoft's stock option footnote for the year ended June 30, 2000. Hall and Leibman (2000) find that 95% of all stock options are nonqualified, so we make the simplifying assumption that all options reported in the footnote are nonqualified.

The footnote contains historic exercise information for the preceding two and current fiscal years (1998, 1999, and 2000 for most of our firms). For each firm, we calculate option deductions as the number of options exercised in a given year times the difference between the average strike price for those options and the share price at exercise. We measure the share price at exercise for a given year using the average stock price for options granted in that same year.[15]

Incorporating historic option deductions into our analysis is straightforward: We subtract the historic employee option deductions from the historic income figures derived in the previous section. Note that historic option deductions can affect the MTR in 2000 by reducing taxable income in 2000 and also by creating a tax loss in 1998 or 1999 that is carried forward into 2000. We also experiment with gathering historic options data for 1995, 1996, and 1997 for a random sample of eight firms to investigate whether losses in these years carry forward into 2000 sufficiently to affect the MTR in 2000. However, the cost of hand-gathering the data is large and the benefit small (these extra data barely affect our results), so we do not pursue gathering pre-1998 option data for other firms.

The footnote also contains information on options already granted, but not yet exercised. To incorporate these future deductions into our analysis, we make assumptions about option exercise behavior. Huddart and Lang (1996) and Core and Guay (2001) report that early exercise of employee stock options is common,

[14] Most companies with multiple plans combine all plans into one aggregate disclosure. In the 12 cases in which firms separate information across plans, we aggregate shares and use weighted averages of variables such as share price and expected term to exercise. Similarly, exercise decisions are disclosed separately for 13 sample firms (e.g., cancellations separated from forfeitures or reloads separated from new grants), and Black–Scholes assumptions are disclosed separately for 15 firms (e.g., different expected lives for executives relative to non-executive employees). Again, we aggregate the disclosures and use a weighted average of the variables, weighted by the number of options in the respective plan. Twenty-eight companies disclose a range for Black–Scholes assumptions, and five disclose a range of exercise prices rather than a weighted average, perhaps reflecting the fact that they use different assumptions for different groups of employees. In these cases, we use the midpoint of the range because sufficient detail is not available to calculate a weighted average. Finally, eight firms disclose dividends per share rather than dividend yield. In these cases, we compute dividend yield based on year-end share price. In total, 73 firms report in one of these nonstandard formats. If we exclude these 73 firms, the mean tax rate increases by approximately 150 basis points, but the overall implications of our study do not change.

[15] For example, using the Microsoft footnote disclosure in the appendix for the year ended June 30, 2000, we estimate the 2000 tax deduction for stock options to be $13,925,340,000, which is the product of the 198 million options exercised and the difference in the weighted average grant price of $79.87 and the weighted average strike price of $9.54.

with much of the exercise occurring about halfway through the option's life, and that exercise tends to spread smoothly over time. Thus, we use the disclosed expected option life as our estimate of when average exercise will occur and assume that exercise is spread smoothly over a period beginning two years before that year and ending two years after that year.[16]

Some stock price paths imply that option exercise is not optimal because the market price is close to or below the strike price (our derivation of future stock price paths is described in the next section). Therefore, we follow the convention in Huddart and Lang (1996) and assume no exercise in years in which options are in-the-money by 15% or less (unless the option is at expiration, in which case we assume all in-the-money options are exercised). In cases in which options are out-of-the-money or barely in-the-money, we defer exercise until the first year in which they are in-the-money by at least 15% (or until expiration).[17]

Future option deductions can affect the current-period MTR in two ways. First, if they are exercised in the next two years and are large enough to generate a tax loss, the tax loss can be carried back to offset taxes paid in 2000. This carryback treatment can result in a refund in 2001 or 2002 for taxes paid in 2000, thereby reducing the 2000 MTR. Second, for firms that do not pay taxes in 2000 but instead carry losses forward, future option deductions potentially add to the amount carried forward. This carryforward treatment can delay the date at which taxes are eventually paid, thereby reducing the (present value of the) current-period MTR.

The last group of options we consider are those that are not yet granted. As just described, these options potentially affect 2000 MTRs via carrybacks if they lead to deductions in 2001 or 2002 (which, given our assumptions about exercise behavior, only occurs for firms with an average option life of four years or less)

[16] We do not explicitly incorporate vesting schedules because the stock option footnotes are often vague and indicate a range of vesting periods. Further, our use of expected lives should incorporate the effects of vesting. To get a sense for the typical vesting schedule, we gather the available information from the option footnotes. The average vesting period (using the midpoint when a range is indicated) is 3.5 years for our sample firms, and most firms indicate that vesting occurs ratably over time, typically beginning within the first year. As a result, our assumption that option exercise is spread over the period beginning two years prior to and ending two years following the expected life (4.8 years on average) seems consistent with the likely vesting schedules. Huddart and Lang (1996) suggest that exercise is common immediately following vesting dates. On another note, it is possible that in 2000 the expected option life that companies report in the footnotes is low by historic standards, due to the bull market of the 1990s, which may have encouraged early exercise and shorter option lives. To investigate how a longer expected life would affect our results, we perform a robustness check in which we add two years to the expected life of all options. The mean estimated tax rate in this analysis is only 20 basis points higher than what we report below, and overall qualitative results are unchanged.

[17] For example, the Microsoft footnote disclosure in the appendix reports a weighted average expected life of 6.2 years and an expiration of 10 years for options granted in 2000. Thus, we assume the options granted in 2000 will be exercised evenly over the period from 2004 to 2008 if they are in the money by at least 15% during those years. If they are not in-the-money by 15%, exercise is deferred until the first year in which they are in-the-money by 15%. In 2010 (the presumed date of expiration), all options that remain outstanding are exercised if they are in the money by any amount.

or by creating large tax losses that will be carried forward. We assume that firms grant future options in an amount equal to the average number granted (net of cancellations) during the past three years, times a growth factor.[18] The growth factor is based on a given firm's preoption income growth (bounded between the 25^{th} and 75^{th} percentiles for income growth rates of other firms in the same two-digit SIC code).[19] The strike price for a given firm-year's newly granted options is assumed to be the forecasted stock price for that firm-year. In the next section we describe how the stock price is determined.

To incorporate future option deductions into our analysis, we subtract the future option deductions along a given simulation path from preoption income (as forecast in Section II.B). This yields a forecast of taxable income after accounting for options. An alternative approach would be to subtract the effect of options from all historic data (up to 20 years of data) and then directly forecast postoption income into the future. Unfortunately, because the stock option disclosures have been required only since 1996, we cannot adjust the estimates of taxable income in all prior years, so this alternative approach is infeasible.

Finally, throughout the study we ignore repricing, that is, reducing the strike price of already granted options. To the extent that firms are committed to a policy of repricing during downward price movements, our approach would lead us to understate future option deductions.

D. Estimating Future Stock Prices

We forecast future stock prices so that we can project the magnitude of future stock option deductions. We project a separate future stock price path associated with each of the 50 simulations of future income described in Sections I and II.B. This procedure allows the value of stock options to vary with stock prices (and because we link stock prices to earnings, to vary with different earnings simulations).

To project future stock prices, we compute an expected return for each firm, based on the CAPM market model. This total return calculation requires a firm-specific beta (taken from CRSP), the risk-free rate (from each firm's stock option footnote), and an equity risk premium of 3% (which is consistent with recent estimates of the risk premium in Fama and French (2002) and Graham and Harvey (2002)).[20] We are interested in capital appreciation in stock price, so we subtract the firm-specific dividend-yield from each firm's total return.

[18] For example, the Microsoft footnote disclosure in the appendix reports grants (cancellations) of 138 (25) million in fiscal year 1998, 78 (30) in 1999, and 304 (40) in 2000. We assume that fiscal year 2001 grants are 141.7 million (i.e., 173.3 million (the mean of 1998, 1999, and 2000 grants) less 31.6 million (the mean of 1998, 1999, and 2000 cancellations)) times a growth factor.

[19] In unreported analysis, we find qualitatively similar results when we perform our calculations based on sales revenue growth, rather than income growth. Sales growth rates are typically much larger than income growth rates in our sample, so we use the latter so that our estimate of future options grant numbers is conservative.

[20] In a robustness check, we use an estimated risk premium of 8.1% (the Ibbotson historic average). This premium leads to a mean tax rate that is 40 basis points lower than the base case mean reported below. All results are qualitatively similar whether we use an 8.1% or a 3% risk premium.

Stock prices tend to vary with earnings. Easton and Harris (1991) show that changes in annual earnings and annual returns are positively related (Pearson correlation of approximately 20%). Therefore, to incorporate this positive empirical association between stock returns and earnings, we modify expected returns to link them to the earnings projections derived in Section II.B. We assume that unexpectedly high earnings are accompanied by proportionally positive expected stock returns. For example, consider a case in which earnings were expected to increase at 10% and stock price was expected to increase at 12%. Suppose that in a given simulation we end up on a path with earnings increasing by 15% in the first year (50% higher growth rate than expected). To link the two series, we assign an expected stock return of 18% on that path for that year (50% higher than expected). This adjustment modifies the expected stock return in a way that links earnings and returns.[21]

Robustness checks, however, indicate that the degree of assumed correlation is not particularly important. When we replicate the study assuming independence between annual earnings and annual returns, inferences are qualitatively unaltered (mean tax rates are 50 basis points higher than those reported in the base case below). Moreover, our qualitative results do not change if we assume an expected stock price increase of 12% annually for all firms.[22]

Given an expected stock return, we project future stock prices by drawing returns from a lognormal distribution. For each year, the mean of this distribution equals the expected return, calculated as just described, and the variance is that reported in the stock option footnotes.[23]

In our approach, we use historic data to estimate income growth (as described in Section II.B) and a modified CAPM expected return (as just described). In a robustness check, we use Value Line projections for the 131 firms in our sample for which Value Line provides estimates. For income growth, we annualize the Value Line "four year growth rate" estimate of sales growth when it is available, or use the Value Line earnings growth rate when sales growth is not available. For stock returns, we annualize the return implicit in the average of

[21] While we directly link growth of earnings and expected stock prices, we do not directly link realized future earnings and stock prices. That is, we use the realized draw for earnings growth on a given earnings path for a given period (15% in our example) to determine the mean expected stock price growth for that period on the associated stock price path (18% in our example). However, on top of that mean, we layer a variance based on the past returns series and draw a return from that distribution. The resulting "realized" return can be substantially different from 18% because of high return variances. In fact, the correlation of simulated earnings and simulated stock prices is approximately 15% in our analysis, which puts our simulated correlation in line with that observed empirically by Easton and Harris.

[22] A related issue is the potential that management makes decisions based on unrealistic or optimistic expectations of future returns. We do not believe that reasonable alternative management beliefs would greatly alter our results. For example, if we set the expected return to 15% and halve the variance of expected returns to capture optimistic managerial beliefs, the mean tax rate falls by only 13 basis points relative to what is reported below.

[23] Since the annual stock price is based on log returns, implied prices cannot be negative. Note also that if we assume that volatility is 25% for all firms (rather than using the volatility firms report in the footnotes), the mean tax rate is only 10 basis points different from that reported below in the base case.

the high and low "four year ahead target stock prices." Using these alternative earnings and stock growth rates yields mean MTRs that are only 12 basis points higher than those we report below, and no difference in the overall qualitative results.

E. Discounting Future Stock Option Deductions

In this section we discuss the discount rate that we use to determine the present value tax consequences of stock option deductions for MTRs. Recall that because of the carryback and carryforward features of the tax code, the effects of today's deductions can potentially be felt far into the future. The issue is determining what rate should be used to discount these future tax consequences.

Some previous research (e.g., Graham (1996, 2000)) uses the corporate bond yield as the discount rate to determine the present value of the tax effect of various deductions (e.g., debt interest) on MTRs and firm value. This approach implicitly assumes that the tax effects of these deductions have the same risk as debt, as assumed by Modigliani and Miller (1958) for interest deductions. It seems less reasonable to discount the effects of future option deductions using the debt rate. Options generate deductions on exercise, and option exercise is correlated with stock returns; therefore, options lead to higher compensation costs, as well as tax benefits, when share prices are high.[24] In the remainder of this section we discuss conceptually how we think that tax liabilities in a stock option world should be discounted, and we link this conceptual framework with our empirical implementation of discounting tax liabilities within the simulation procedure.

To keep the discussion focused on the discount rate, we start by making several simplifying assumptions. We assume that options are cash settled, or equivalently, that firms purchase shares in the open market to deliver to employees when they exercise their options. Shares are repurchased at a fair and efficient market price, using funds that would have otherwise been invested in zero–net present value projects, so there are no dilution concerns and no change in the number of shares outstanding. We also assume that there are no incentive effects from options (and therefore that option incentive effects do not cause employees to work harder in some states, nor change the cash flows or correlation of pretax income and the market return).[25] Finally, we assume that

[24] While the per-share option deduction is directly the result of stock price appreciation, the correlation between option deductions and contemporaneous-year returns is likely to be well below one for at least two reasons. First, options are typically exercised in about the fifth year of their lives and the per-share deduction is determined by the multi-year return, so the current year return is a relatively small part of the deduction. Second, the number of options exercised is a function of many factors beyond current year return (e.g., prior exercise, cancellation, market/strike ratio, and liquidity concerns), so the current year return may be high but exercise low because employees opt not to exercise.

[25] We thank Terry Shevlin for pointing out these incentive possibilities. We thank Bob McDonald for suggesting the basic framework that we discuss next.

no-option cash flows are positively correlated with the market, so the firm's no-option cash flow beta is positive, as is the beta on no-option taxable income.

Given these assumptions, how should tax liabilities be discounted for a firm that uses options as part of their compensation package? (Note that the only place where we use a discount rate is within the simulation procedure, to discount the incremental future tax liability stream associated with earning an extra dollar in 2000). If a firm pays a fixed wage W, after-tax income (ignoring carrybacks and carryforwards) is

$$CF - W - \tau_C * (CF - \min[CF, W]),$$

where CF is cash flow (before the effects of wages or options) and τ_C is the corporate income tax rate. The "min" appears because tax liabilities cannot be negative. When $\min(CF, W) = W$, this becomes simply $(CF - W)(1 - t)$. For convenience, it is assumed that wage payments are uncorrelated with stock prices.

With option cash settlement and assuming that options have a negligible strike price, after-tax income is

$$CF - m * S - \tau_C * (CF - \min[CF, m * S]),$$

where S is the stock price and m is the number of options exercised.

Our variable of interest, the tax liability, is $\tau_C * (CF - \min[CF, m * S])$, which is the quantity we discount in the simulation procedure. The covariance of tax liabilities with the stock price is

$$\tau_C * \text{Cov}(CF - \min[CF, m * S], S) = \tau_C * \{\text{Cov}(CF, S) - \text{Cov}(\min[CF, m * S], S)\}.$$

Both covariance terms in the braces will generally be positive, so the sign of the overall correlation between tax liabilities and stock price depends on which covariance is larger. Because cash flows are generally substantially larger than option deductions, the overall correlation between tax liabilities and stock price will typically be positive, but if the second term in the braces is large enough in absolute magnitude, the overall correlation can be negative. If the second term is small, the correlation does not differ much from the correlation in the "no options" case. It is an empirical matter as to whether the overall correlation is positive or negative.

Using data for the firms in our sample, we determine that the correlation between tax liabilities and stock price is positive on average for the levels of these two variables, and also for percentage changes for these two series. Therefore, our argument is that the beta is positive for tax liabilities and the appropriate rate to discount tax liabilities lies somewhere between the risk-free rate and the equity rate. We show below that the implications in our paper do not change for various discount rates in this range.

In the base case for this paper, to determine the present value of incremental tax liabilities associated with earning an extra dollar in 2000 (i.e., to determine the year-2000 MTR), we discount using a firm-specific equity rate. This is conservative relative to using a smaller discount rate because it will reduce the effect of changes in future tax liabilities on current-period MTRs. Discounting with an equity rate is an approximation because it misses the fact that option deductions are zero below some exercise price, and hence do not contain pure equity risk. It is also an approximation because it does not explicitly account for the association between earnings and stock prices inherent in our approach (see Section II.D for details). However, these approximations are likely to have only a modest effect because our ultimate variable of interest is the MTR, which is bounded between 0 and 35%.[26] This implies that any errors we make in discounting will have an attenuated effect on our MTR estimates (because the MTR cannot vary outside of the range from 0 to 35%, no matter how we discount).

To ensure that our results are not sensitive to the discount rate, we conduct several sensitivity analyses. Technically, option deductions could be discounted as options rather than as pure equity. Therefore, we implement an approach based on the contingent claims valuation outlined in Schwartz and Moon (2000). Specifically, we assume an earnings risk premium of 2% per year, increase stock prices at the risk-free rate, and discount everything at the risk-free rate. In another set of robustness checks, we follow our standard simulation approach but discount using very high (e.g., double the CAPM market-model discount rate) and very low (e.g., the risk-free rate) discount rates.

The empirical results indicate that the discounting assumption has only a second-order effect on the estimated MTR. For example, doubling the discount rate reduces the estimated tax rate 120 basis points relative to what we report below, and does not change the qualitative results. The Schwartz and Moon (2000) approach reduces the estimated MTR by 100 basis points. All other robustness checks on the discount rate lead to smaller changes in the estimated MTR. While conceptually important, the choice of discount rate only has a modest effect on our empirical estimates of the MTR. This reflects the fact that the magnitudes of historic, current, and very near-term option deductions are the dominant effects on current MTRs, more so than distant option deductions (for which the discount rate would be more important).

III. Empirical Analysis of the Effect of Option Deductions on Corporate MTRs

A. Descriptive Statistics

Table I presents descriptive statistics for the stock option disclosures of the S&P 100 and Nasdaq 100 samples. For both groups, the average expected option life is close to five years, although it is slightly shorter for Nasdaq firms, consistent with the higher volatility for Nasdaq firms, possibly coupled with risk aversion, precipitating early exercise. Not surprisingly, given GAAP reporting requirements, the risk-free rate is very similar for the two samples, equaling approximately 6%. The small difference in the risk-free rate for the

[26] We thank Bob McDonald for pointing this out.

Table I

Descriptive Statistics on Option Characteristics

All variables are from the Black–Scholes option valuation assumptions in the company financial statement footnotes. Expected life is years from grant until average exercise. The risk-free interest rate is the rate on zero-coupon U.S. government issues with remaining term equal to the expected life of the options. The dividend yield is dividends as a percentage of share price. The annual return volatility is the standard deviation of the continuously compounded rates of return on the stock (i.e., standard deviation of the difference in the natural logarithm of stock prices).

	Mean	Median	Std. Dev.	25th Perc.	75th Perc.
		S&P 100 in 2000			
Expected Life	5.26	5.00	1.57	4.20	6.40
Risk-Free Rate	6.11	6.20	0.50	5.90	6.48
Dividend Yield (%)	1.48	1.24	1.40	0.13	2.40
Annual Return Volatility	36.4	33.4	12.9	28.6	42.1
		Nasdaq 100 in 2000			
Expected Life	4.41	4.40	1.79	3.27	5.00
Risk-Free Rate	5.88	6.00	0.59	5.60	6.25
Dividend Yield (%)	0.09	0.00	0.50	0.00	0.00
Annual Return Volatility	74.6	73.0	25.5	55.0	93.4

two samples probably reflects differences in year-ends (because risk-free rates should be similar for firms with common year-ends), with noncalendar year-ends being more common for Nasdaq firms.

Dividend yield averages 1.5% for S&P 100 firms with most firms paying dividends. Conversely, few Nasdaq 100 firms pay dividends; the mean dividend yield is 0.1% and the 75th percentile is zero. Annual stock return volatility is higher for Nasdaq 100 firms, with a mean volatility of 75% versus 36% for the S&P firms. The volatility of returns is important because it affects the probability that stock price appreciates greatly, which would lead to large option deductions in good scenarios.

Table II summarizes firm characteristics. Not surprisingly, the market capitalization of the typical S&P 100 firm is roughly five times larger than that for Nasdaq 100 firms. However, there is substantial overlap between the two distributions, with the 75th percentile of Nasdaq firms being one-third larger than the 25th percentile of S&P firms. The difference in size between the two subsamples is more pronounced for total assets, reflecting the fact that Nasdaq valuation is based more prominently on intangibles and growth options.

In terms of profitability, the median return on assets (ROA) is quite similar for the two samples, and is actually a little higher for the Nasdaq firms (4.9%) than for the S&P firms (4.7%). The 75th percentiles are also similar for the subsamples. However, the dispersion of profitability is higher for Nasdaq firms, with a much higher proportion reporting losses. In fact, the 25th percentile ROA is −3.4% for the Nasdaq firms versus 1.5% for the S&P firms. Nasdaq firms tend to use less debt in their capital structure, with a mean (median) debt

Table II
Descriptive Statistics on Firm Characteristics

The measure *asset* is total assets; *market equity* is the value of common equity at fiscal year-end; *return on assets* is net income divided by assets; *debt/value* is total debt divided by the market value of the firm; and *beta* is the market-model beta as reported on CRSP.

	Mean	Median	Std. Dev.	25th Perc.	75th Perc.
S&P 100 in 2000					
Asset ($M)	76,887	27,445	139,659	10,673	52,150
Market equity ($M)	65,006	28,777	82,705	12,123	80,879
Return on assets (%)	6.6	4.7	6.7	1.5	10.9
Debt/value (%)	17.5	13.4	15.9	5.1	24.5
Beta	0.98	0.98	0.53	0.56	1.33
Nasdaq 100 in 2000					
Asset ($M)	5,716	2,270	11,441	1,379	6,178
Market equity ($M)	13,453	8,605	14,014	5,136	16,885
Return on assets (%)	−1.3	4.9	39.5	−3.4	10.3
Debt/value (%)	6.7	1.0	11.2	0.0	7.1
Beta	1.16	1.22	0.59	0.76	1.61

ratio of 6.7% (1%) versus 17.5% (13.4%) for the S&P firms. Both samples have average betas of approximately one, although the S&P firms are slightly below one while the Nasdaq firms have betas slightly above one.

Figure 1 summarizes the overall effect of option deductions on the year-2000 corporate MTR (i.e., the effect of all historic and future exercises). The histogram shows MTRs for all 190 firms in our sample, with and without the effects of options. Options cause a significant shift in MTRs. Before options, 24% of the sample face MTRs of less than 10% while after considering options, 35% face such rates. Similarly, before options, 65% of the sample firms face MTRs above 30% as compared with 46% after factoring in options.

In the next two sections, we analyze the effects of options separately for S&P and Nasdaq firms, and break out the effects by historic versus future exercise activity.

B. Tax Effects for S&P 100 Companies

Table III presents evidence on the effects of option deductions on MTRs, segregated by sample. The first row contains estimated MTRs for fiscal year-end 2000, produced using standard tax deductions and deferred taxes to infer taxable income, but before taking stock options into account. This computation is comparable to the one used in Graham (1996), with the only differences being that we bound income growth and volatility to lie within the 25th and 75th industry percentiles and that we discount the tax consequences of option deductions with the cost of equity. The median MTR for the S&P 100 firms in

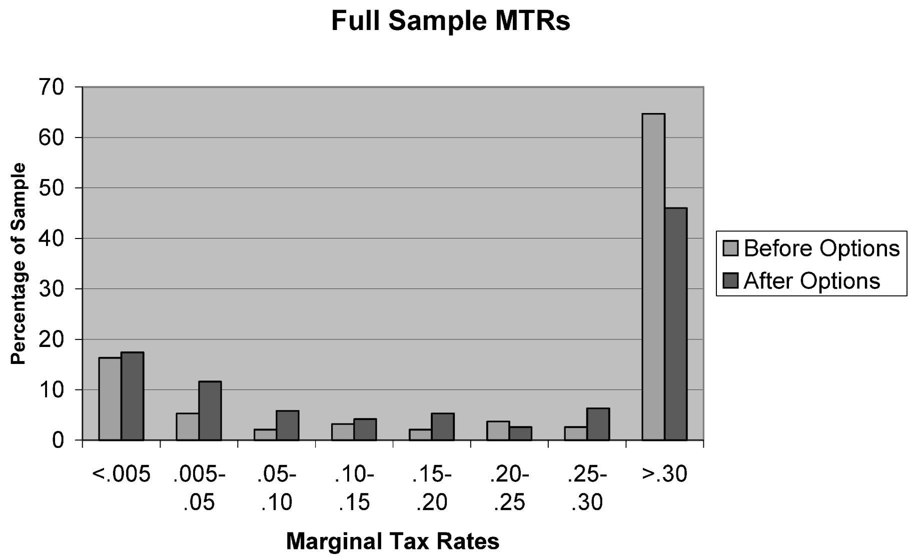

Figure 1. Histogram for marginal tax rates for the 190 firms in the S&P 100 and Nasdaq 100 in July, 2000. The columns *before options* are simulated tax rates based on earnings before tax (EBT) but ignoring option deductions. The columns *after options* are simulated tax rates based on EBT, including the effect of option deductions.

2000 is the top statutory rate of 35%, while the mean is 29%, which is consistent with prior studies that show clustering at the upper end of the statutory rates. The 25th percentile MTR is 32%, reflecting the fact that most S&P 100 firms face relatively high tax rates. However, the 5th percentile is zero, consistent with a few S&P 100 firms not expecting to pay any taxes over a 23-year period (e.g., after carrying losses in 2000 back two years to 1998 and forward 20 years to 2020).

The next three rows of Table III illustrate the impact of stock option deductions on MTRs. Recall that there are several groups of stock option deductions: already exercised (second row: "MTR w/exercised options"), already granted but not yet exercised (third row: "MTR w/current grants"), and not yet granted (fourth row: "MTR w/future grants"). For the S&P 100 sample, we find that incorporating stock options into the simulations has relatively little effect on the MTRs. In the fourth row of Table III, when all option deductions are considered (including future grants and future exercises), the median MTR is still 35%. For the 25th percentile, the estimated MTR drops from 32% to 26%.

The fifth row of Table III summarizes the change in MTRs brought about by option deductions ("ΔMTR w/future grants"). Inferences are the same. Options materially reduce MTRs for only about one-fourth of S&P firms. When we consider all options, the mean reduction is 1%. Among the firms with the largest drop in tax rates, the 25th percentile MTR falls by 1% and the 5th percentile MTR decreases by 5%.

Table III

Effect of Employee Stock Option Deductions on Marginal Tax Rates

This table summarizes the effect of option deductions on corporate marginal tax rates (MTRs) for all 190 firms for which we can calculate tax rates. The measure *MTR w/o options* is a simulated MTR, assuming there are no employee stock option deductions, based on earnings before tax (EBT). A simulated MTR accounts for the tax-loss carryback and carryforward features of the tax code. The measure *MTR w/exercised options* is the simulated rate except that historic deductions from options exercised in 1998, 1999, and 2000 are subtracted from EBT. The measure *MTR w/current grants* is the simulated MTR, with historic deductions and future deductions associated with already granted options deducted from EBT. The measure *MTR w/future grants* is the simulated MTR, with historic deductions, future deductions for already granted options, and deductions for not-yet-granted options deducted from EBT. The measure Δ*MTR w/future grants* is *MTR w/future grants* minus *MTR w/o options*, so a negative number indicates that option deductions lead to a reduction in the tax rate. The measure *2000 stock option deductions* is the dollar figure (in millions) of option deductions in 2000. The measure *2000 deductions/pretax income* is 2000 deductions divided by pre-option EBT. The columns show the mean and standard deviation across all sample firms, as well as the 5th, 25th, 50th, 75th, and 95th percentiles.

	Mean	Std. Dev.	5%	25%	50%	75%	95%
			S&P 100 in 2000				
MTR w/o options	0.29	0.11	0.00	0.32	0.35	0.35	0.35
MTR w/exercised options	0.29	0.11	0.00	0.27	0.35	0.35	0.35
MTR w/current grants	0.28	0.11	0.00	0.26	0.35	0.35	0.35
MTR w/future grants	0.28	0.12	0.00	0.26	0.35	0.35	0.35
ΔMTR w/future grants	−0.01	0.04	−0.05	−0.01	−0.00	0.00	0.00
2000 Stock Option Deductions	640	1764	0	16	102	389	3,099
2000 Deductions/Pretax Income	0.21	0.59	0.00	0.01	0.04	0.12	1.11
			Nasdaq 100 in 2000				
MTR w/o options	0.20	0.16	0.00	0.00	0.31	0.35	0.35
MTR w/exercised options	0.17	0.15	0.00	0.00	0.15	0.34	0.35
MTR w/current grants	0.13	0.13	0.00	0.00	0.08	0.27	0.35
MTR w/future grants	0.11	0.13	0.00	0.00	0.05	0.26	0.35
ΔMTR w/future grants	−0.08	0.12	−0.32	−0.13	−0.02	0.00	0.00
2000 Stock Option Deductions	387.8	557	0	52	173	449	1,637
2000 Deductions/Pretax Income	0.23	5.35	−2.35	−0.18	0.14	1.03	4.73

Even though employee stock option deductions do not substantially reduce the MTR for many S&P 100 firms, the deductions have a noticeable effect on corporate tax liabilities. The bottom two rows of Table III present gross deductions expressed in dollar terms and as a percentage of earnings before tax. The mean S&P firm had $640 million of option tax deductions in 2000. With 99 firms in the sample, this implies total deductions of $63.4 billion. With aggregate pretax earnings of approximately $349 billion for S&P 100 firms, stock option deductions represent nearly one-fifth of aggregate pretax income. Option deductions are 4% of pretax income for the median firm, 12% for the 75th percentile, and 111% for the 95th percentile.

To summarize, S&P 100 firms substantially reduce their tax liabilities through deductions for nonqualified employee stock options. However, while option deductions reduce tax rates for some firms, the tax savings do not translate into significantly lower MTRs for the typical (highly profitable) S&P 100 firm. Though option deductions slash their tax bills, only about one-fourth of S&P 100 firms have enough deductions to (1) fully offset the current year's preoption income and also eliminate the past two years of taxable income; (2) generate losses in 2001 and 2002 that can be carried back to fully offset income in 2000; or (3) for currently nontaxable firms, delay when tax consequences are realized for year-2000 option deductions. One or more of these conditions must be met for option deductions to reduce MTRs.

C. Tax Effects for Nasdaq 100 Companies

Options dramatically affect the MTRs of Nasdaq 100 companies. The median MTR before options is 31% and the mean is 20% (see the bottom panel in Table III), suggesting that Nasdaq firms have relatively high MTRs before the effects of options, though not as high as the MTRs of S&P 100 firms. For the median firm, just considering historic exercises reduces the MTR from 31% to 15%. Incrementally considering options that are already granted but not yet exercised reduces the median MTR from 15% to 8%. Considering all forms of option deductions, including those from future grants, reduces the median MTR all the way down to 5%. Considering all deductions, the 75th percentile drops from 35% to 26%, indicating that option deductions affect most Nasdaq 100 firms.

The proportion of Nasdaq firms with an MTR less than 0.05 increases from 33% to 50%. This increase implies that half of the Nasdaq 100 firms anticipate paying very little in corporate taxes from 1998 (the beginning of the two-year carryback period for 2000 losses) to 2020 (the end of the carryforward period for 2000 losses). Overall, the mean (median) decrease in MTRs is 8% (2%). The size of the decline is limited by the fact that MTRs are bounded below by zero.

In 2000, the median Nasdaq 100 firm enjoyed option-related tax deductions of $173 million, with a mean of $388 million. Aggregating across the 91 firms in our Nasdaq sample, the resulting deductions total about $35 billion. This figure is striking because it is larger than the $13 billion of aggregate earnings before taxes and option deductions for the Nasdaq sample in 2000. Note that these large deductions do not eliminate all taxes for the Nasdaq 100 because some firms have preoption income that exceeds option deductions and others have deductions that expire unused; however, it does indicate the enormous magnitude of the option deductions.

Figure 2 summarizes the effect of options on the MTRs of Nasdaq firms. Before options are considered, 52% of Nasdaq firms face MTRs exceeding 0.30; after considering options, only 18% do. Almost 60% of the Nasdaq 100 face postoption MTRs below 10% and almost 30% face MTRs of approximately zero. If one were to ignore option deductions, these figures imply that most Nasdaq companies would reap substantial tax advantages from tax shields, such as

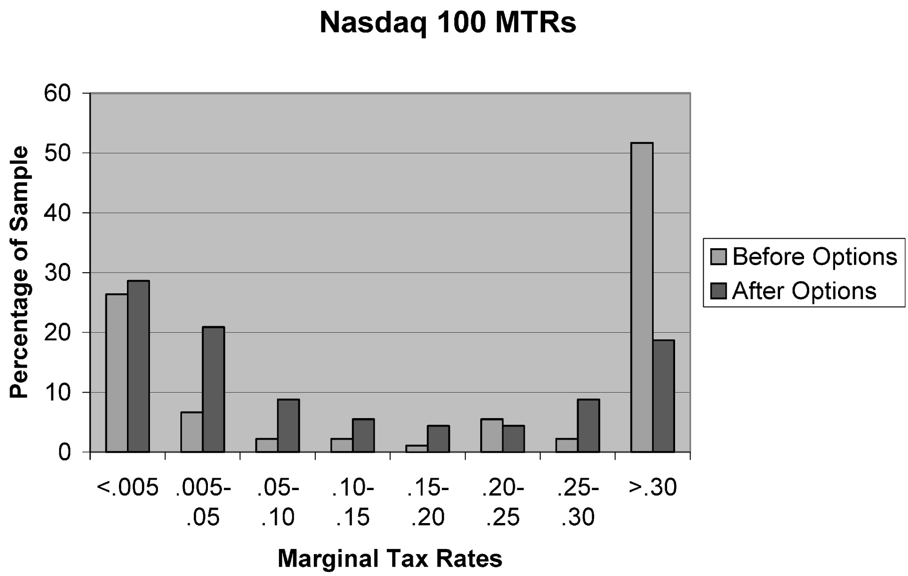

Figure 2. Histogram for marginal tax rates for the firms in the Nasdaq 100 in July, 2000. The columns *before options* are the simulated tax rates based on earnings before tax (EBT) but ignoring option deductions. The columns *after options* are simulated tax rates based on EBT, including the effect of option deductions.

interest. After considering option deductions, only a minority of Nasdaq firms has much of a tax incentive to finance with debt.

IV. Empirical Analysis of the Effect of Option Deductions on Debt Policy

The preceding section indicates that the effects of stock options on MTRs can be substantial, especially among option-intensive companies. These substantial effects imply that option deductions might affect corporate policies for which the MTR is an important decision variable. In this section we explore whether the effect of option deductions on MTRs is important to corporate debt policy decisions. This investigation has the potential to help explain why some firms appear to use too little debt when the effects of option deductions are ignored.

A. Univariate Analysis of Debt Policy

Table IV presents Pearson and Spearman correlations between preinterest MTRs and various measures of debt in the capital structure, specifically, debt-to-market value, debt-to-assets, and interest-to-market value. We examine preinterest MTRs because Graham, Lemmon, and Schallheim (1998) show that corporate tax status is endogenously affected by debt policy. That is, when a firm uses debt, the associated interest deduction reduces taxable income and

Table IV

Correlations between MTRs and Leverage for Combined Sample of S&P 100 and Nasdaq 100 Firms in 2000

Pearson (Spearman) correlations between corporate MTRs and various measures of debt policy appear above (below) the main diagonal. The measure *MTR w/o options* is a simulated MTR, assuming there are no employee stock option deductions, based on earnings before tax (EBT). The measure *MTR w/future grants* is the simulated MTR, with historic deductions, future deductions for already granted options, and deductions for not-yet-granted options deducted from EBT. The measure Δ*MTR w/future grants* is *MTR w/future grants* minus *MTR w/o options*. The measure *debt-to-value* is total debt divided by the market value of the firm, where market value equals book assets minus book equity plus market equity. The measure *debt-to-assets* is total debt divided by total assets. The measure *interest-to-value* is debt interest divided by market value. The measure *deductions-to-value* is the dollar amount of option deductions in 2000 divided by market value. The measure *kink* is the proportion by which interest could be increased before the value of incremental interest deductions would begin to fall. Kink is calculated as in Graham (2000) using pre-option earnings. A high value for kink can be interpreted to mean that a firm has unused debt capacity (ignoring the effect of option deductions). These correlations are for the 150 firms included in the regression analysis. Significance for the tax variables tests whether the correlation coefficient equals zero versus the alternative that the coefficient is greater than zero.

	MTR w/o Options	MTR w/ Future Grants	ΔMTR w/ Future Grants	Debt-to-Value	Debt-to-Assets	Interest-to-Value	Deductions-to-Value	Kink
MTR w/o options		0.79***	−0.21***	0.04	0.03	−0.19***	−0.30***	0.46***
MTR w/future grants	0.73***		0.44***	0.23***	0.12*	0.13*	−0.57***	0.28***
ΔMTR w/future grants	−0.04	0.48***		0.29***	0.14**	0.37***	−0.43***	−0.23***
Debt-to-value	0.09	0.34***	0.37***		0.76***	0.95***	−0.30***	−0.42***
Debt-to-assets	0.08	0.27***	0.25***	0.89***		0.70***	−0.18**	−0.22***
Interest-to-value	−0.09	0.25***	0.53***	0.97***	0.81***		−0.28***	−0.56***
Deductions-to-value	−0.24**	−0.57***	−0.55***	−0.51***	−0.39***	−0.53***		0.12*
Kink	0.44**	0.35**	−0.12*	−0.27***	−0.16**	−0.46***	0.06	

***, **, and * indicate statistical difference from zero at the 0.01, 0.05, and 0.10 levels, respectively.

can also reduce the MTR, which induces a spurious negative correlation between debt ratios and tax rates. This endogeneity can be avoided by using preinterest MTRs (that is, tax rates based on earnings before interest and tax) when examining the relation between debt ratios and tax rates.

The first row (column) in Table IV displays the Pearson and Spearman correlation between the debt variables and conventional preinterest MTRs (MTR without options), that is, before the effects of interest and options. For all three measures, both Spearman and Pearson correlation coefficients vary in sign and are insignificant (except for the Pearson correlation on interest/value, which is significant but has the wrong sign). These correlations provide little evidence that capital structure is correlated with MTRs for our sample when we ignore options deductions.

The second row and column show the relation when the computation of preinterest MTRs is modified to include all employee stock option deductions (MTR with future grants). The relation is positive for all three debt variables. For the Spearman correlations, the correlations range from 0.25 to 0.34 and are always significant at the 0.01 level. These results are consistent with managers making financing and compensation decisions jointly, considering the effect of options on MTRs.[27]

The third row and column present the correlations between the changes in preinterest MTRs resulting from options (ΔMTR with future grants) and the other variables. Two points are worth noting. First, the correlation between the decrease in rates and the postoption MTRs is strongly positive, indicating that options have a significant effect on MTRs. Second, the decrease in rates is positively correlated with the amount of debt in the capital structure. This correlation implies that firms that use options intensively enough to reduce their MTR use relatively little debt, which is consistent with firms trading off options and interest deductions.

B. Regression Analysis

To further assess the relation between option deductions, MTRs and debt, Table V presents tobit regressions with debt-to-value as the dependent variable.[28] We use the tobit method because the debt ratio equals zero (i.e., is left-censored) for 17 firms in our sample. Since determining a debt ratio for

[27] This interpretation is consistent with our conversations with tax managers at several high-technology companies. Although these firms appear profitable based on their income statements, the managers indicate that debt is not particularly attractive because the company pays little in taxes. Similarly, this result may explain why Microsoft and Dell's derivatives trading is not as tax-inefficient as implied by the effective tax rates reported in their financial statements (McDonald (2002)).

[28] A potential concern is that share price movements can affect both the debt-to-value ratio and stock option deductions (and hence MTRs). To investigate this issue, we also estimate the regressions with debt-to-assets replacing debt-to-value. Consistent with the high correlation between debt-to-value and debt-to-assets in Table IV, regression results for debt-to-assets are qualitatively similar to those for debt-to-value, though weaker statistically.

Table V

Tobit Regressions of Debt-to-Value on Marginal Tax Rates and Control Variables

Results are from cross-sectional regressions using data from 2000. The dependent variable is *debt-to-value* (total debt divided by the market value of the firm, where market value equals book assets minus book equity plus market equity). *MTR w/o options* is a simulated MTR, assuming there are no employee stock option deductions, based on earnings before tax (EBT). The measure *MTR w/exercised options* is the simulated rate except that historic deductions from options exercised in 1998, 1999, and 2000 are subtracted from EBT. The measure *MTR w/current grants* is the simulated MTR, with historic deductions and future deductions associated with already-granted options deducted from EBT. The measure *MTR w/future grants* is the simulated MTR, with historic deductions, future deductions for already-granted options, and deductions for not-yet-granted options deducted from EBT. The measure *ΔMTR w/future grants* is *MTR w/future grants* minus *MTR w/o options*. The measure *PP&E/assets* is property, plant, and equipment divided by total assets. The measure *Quick ratio* is cash plus receivables, the sum divided by current liabilities. The measure *cash flow* is operating cash flow divided by total assets. The measure *R&D* is research and development expense divided by sales. The measure *sales* is sales revenue. Five significant 2-digit SIC code dummies are included in all specifications but are not shown in the table. Regression coefficients and *p*-values (in parentheses) are shown.

	Models						
	1	2	3	4	5	6	7
Intercept	0.08	0.05	−0.00	0.01	0.03	0.04	0.04
	(0.01)	(0.01)	(0.93)	(0.76)	(0.46)	(0.41)	(0.46)
MTR w/o options	0.07		0.13				0.22
	(0.42)		(0.07)				(0.01)
MTR w/exercised options				0.18			
				(0.03)			
MTR w/current grants					0.22		
					(0.01)		
MTR w/future grants		0.23				0.21	
		(0.01)				(0.01)	
ΔMTR w/future grants							0.19
							(0.06)
Lag PP&E/Assets			0.13	0.12	0.11	0.10	0.10
			(0.01)	(0.03)	(0.05)	(0.06)	(0.06)
Lag quick ratio			0.00	0.00	0.00	0.00	0.00
			(0.78)	(0.78)	(0.80)	(0.81)	(0.84)
Lag cash flow			−0.49	−0.50	−0.49	−0.48	−0.48
			(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Lag R&D			−0.12	−0.13	−0.13	−0.13	−0.13
			(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Lag sales			0.01	0.01	0.01	0.01	0.01
			(0.04)	(0.12)	(0.33)	(0.35)	(0.34)
N	150	150	147	147	147	147	147

a financial institution is problematic, we delete the 40 firms that have a primary or secondary division that is financial (2-digit SIC code between 60 and 69). For deletion, we require that the financial division contribute at least 10% to total firm revenue. This process leaves 150 firms (down from the 190 included in Section II).

The first two columns of Table V are univariate and regress debt-to-value on MTR without options and MTR with future grants, respectively. Like the correlation coefficients presented in Table IV, the coefficient on the MTR variable, when all stock options are ignored, is insignificant. The coefficient on the MTR variable, when stock options are considered, is significantly and positively correlated with the debt ratio at the 0.01 level (see column 2).

In addition to being statistically significant, the coefficient estimate on the MTR variable is economically large. For example, consider the predicted debt/value ratios for firms at the 25th and 75th MTR with future grants percentiles (MTRs of 2.3% and 35%, respectively). We gauge economic significance using the slope coefficient estimate of 0.23, the intercept of 0.05, and a tobit adjustment factor of 0.88 that accounts for the effect of using a censored normal distribution (Maddala (1983)). The implied debt/value ratio is 0.049 (the 23rd debt/value percentile) for a firm at the 25th MTR percentile, versus 0.115 (the 61st debt/value percentile) for a firm at the 75th MTR percentile.[29] In other words, moving from the 25th percentile to the 75th percentile in the MTR distribution, the implied amount of debt in the capital structure more than doubles, from well below the debt/value median to well above.

A number of nontax factors can affect debt policy, and it is important to control these potential influences in a multivariate analysis. Controlling such influences helps isolate tax effects and minimizes the possibility that the tax variable proxies for some other factor. For example, financially weak firms face lower tax rates and also might face barriers to borrowing and therefore use options to save cash. It seems unlikely that this condition drives the correlation between debt and tax rates, because if the issue is simply that less profitable firms are less able to obtain debt financing, the relation between debt and MTRs before options should be significant, but it is not. However, to ensure that differences in financial health do not drive our results, we include controls for financial strength in the regression: operating cash flow divided by assets and the quick ratio.

We also control three other factors that are commonly thought to drive debt policy (see Rajan and Zingales (1995)): Growth options, asset tangibility, and firm size. Firms with extensive growth options might use less debt to avoid the underinvestment problem (Myers (1977)). Shareholders of a firm with risky fixed claims in its capital structure will potentially underinvest by forgoing positive NPV investments because project benefits might accrue to the firm's existing bondholders; this problem is likely to be more severe among growth firms. Therefore, we expect firms with growth options, which we measure with research and development expense divided by sales, to use less debt. In contrast, firms with more tangible assets, as measured by property, plant, and equipment divided by total assets, are less subject to underinvestment and informational asymmetry problems, and also have more assets to collateralize, and therefore can use more debt. Finally, larger firms are thought to have better

[29] The calculation is $0.88 \times (0.05 + 0.23 \times 0.023) = 0.049$ and $0.88 \times (0.05 + 0.23 \times 0.350) = 0.115$.

access to debt markets, which allows them to borrow more. We therefore expect a positive relation between debt ratios and firm size, which we measure with sales revenue.

Note that data are missing for at least one of these explanatory variables for three observations, so the regressions that include control variables have 147 observations. Finally, though not shown in the tables, every regression specification includes five industry dummy variables based on 2-digit SIC codes. We choose these five industries by performing a regression that includes a dummy for each 2-digit SIC code, and then retaining the five that are significant: SIC codes 26 (paper and allied products), 40 (railroads), 48 (communications), 49 (utilities), and 78 (amusements).

The third through sixth columns of Table V report results for tobit regressions that include tax rates and the control variables. To reduce any potential effect of endogeneity between debt policy and the explanatory variables, we use the lagged values of the control variables. The coefficients on the control variables have the correct signs and are generally significant. These estimated coefficients indicate that firms with many tangible assets use more debt, but that firms with substantial growth options (as measured by R&D) use less debt. Also, consistent with a pecking-order view (Myers and Majluf (1984)), firms with more cash flow use less debt. Finally, large firms use more debt than do small firms.

More importantly for this study, in the third column, the control variables increase the significance of the preoption tax rate, although it is only marginally significant at conventional levels (p-value of 0.07). In the fourth column, the coefficient on the tax rate that includes the effects of historic option deductions (MTR with exercised options) is larger and more significant than the no-options tax rate (p-value of 0.03). In the next two columns, coefficients on the tax rates that consider the effects of currently granted options (fifth column) and also future option grants (sixth column) are both significant at the 0.01 level.[30] The increasing statistical significance of the tax variables highlights the influence of stock option deductions on MTRs and debt policy.

The far right column in Table V presents a specification that includes the control variables, the tax rate variable that ignores options, and the difference between the no-options tax rate and the MTR with future grants. By using two tax variables, we are able to examine the effects on debt policy of traditional tax effects separately from the incremental effect of options. In this specification, the MTR without options tax variable is significant at the 0.01 level, and the incremental effect of options is significant at the 0.06 level, and both coefficients have the expected sign. The fact that the coefficient on MTR without options becomes significant in the presence of the ΔMTR with future grants variable is striking, because it suggests that the effect of nonoption factors is strengthened once options are accounted for. Further, the coefficients on the MTR without options and ΔMTR with future grants variables are similar, suggesting that both option-related and nonoption-related tax effects are of comparable importance

[30] The adjusted-R^2 is 60% in an OLS version of the regression in the sixth column.

in determining debt policy. Thus, we conclude that taxes affect capital structure decisions for reasons unrelated, as well as directly related, to deductions that result from employee stock options.

C. Robustness Checks of Regression Results

We perform a number of robustness checks that consist of adding additional control variables or estimating the regressions on subsets of the data (see Table VI). Though the estimated coefficients are not shown in Table VI, the control and industry dummy variables from Table V are included in all of the Table VI specifications. First, we examine the tax variable based on Value Line growth estimates and stock price forecasts, rather than using historical data to estimate income growth and the CAPM to estimate stock returns. The far left column in Table VI indicates that the Value Line tax variable coefficient is 0.21 (and significant at the 0.01 level), which is identical to the base case results in Table V.

Second, we include an S&P dummy variable (second column of Table VI). Suppose that our results are explained by differences between Nasdaq and S&P firms. Nasdaq firms may have low debt because of a nontax effect (e.g., perhaps because they have substantial growth options) and a low tax rate (possibly because growth firms often are currently or have recently been unprofitable). S&P firms may have high debt ratios and high tax rates. If so, then including an S&P dummy could cause the tax variable to be insignificant. In fact, the tax variable is less significant when the S&P dummy is included—but it is still significant (p-value of 0.06).

The third column summarizes the results of including stock volatility as a right-side variable. Firms with volatile returns might be considered risky and therefore have higher costs of debt and borrow less. The sign of the volatility coefficient is negative and consistent with this hypothesis but it is not significant. Importantly, the tax variable is still positive and significant even when the stock volatility variable is included as a control.

The fourth column shows the results when a control variable measuring the dollar value of deductions, scaled by assets, is included. The purpose of this control is to rule out the possibility that the debt ratio is related solely to a firm's option intensity. The positive coefficient on the tax variable (p-value of 0.08) provides some assurance that the effect of the options on the MTRs has incremental value beyond merely identifying option-intensive firms.

The fifth column of Table VI uses debt minus cash as the dependent variable. This allows "negative debt" for firms that have large cash holdings but very little or no debt, such as Microsoft. Because the dependent variable is no longer censored at zero, we estimate the model with OLS. Again, the tax coefficient is positive and significant in this alternative specification.

The sixth through tenth columns of Table VI show the results from performing the main regression specification on different subsets of data. The intent of these five specifications is to investigate whether the significant tax results might be driven primarily by the contrasting behavior of two types of

Table VI

More Regressions of Debt-to-Value on Marginal Tax Rates and Control Variables

Results are from cross-sectional regressions using data from 2000. The dependent variable is *debt-to-value* (total debt divided by the market value of the firm, where market value equals book assets minus book equity plus market equity). The measure *MTR w/future grants* is the simulated MTR, with historic deductions, future deductions for already-granted options, and deductions for not-yet-granted options deducted from EBT. The measure *MTR w/future grants* (*Value Line*) is the same simulated tax variable, based on stock price and growth projections from Value Line. The measure *S&P dummy* is an indicator variable that takes on a value of one for S&P firms and zero for Nasdaq firms. The measure *stock volatility* is the volatility of stock returns. The measure *option deductions/assets* is the dollar value of tax deductions from employee stock options divided by total assets. Though not shown in the table, each regression includes *PP&E/assets, quick ratio, cash flow, R&D, sales*, and five 2-digit SIC code dummies. Regression coefficients and *p*-values (in parentheses) are shown for the tax variable(s) and new control variables. The righthand five columns summarize regressions that include, respectively, only firms that have nonzero debt, earnings greater than zero, an S&P bond rating, an investment grade bond rating, and annual growth larger than the mean growth in taxable income for the sample (3.6%). The four lefthand columns include all firms with nonmissing values for the explanatory variables. The regressions are all tobit specifications, except for the "Dep var = debt-cash" and "Debt > 0" columns, which are OLS. The measure *debt-cash* allows negative debt because the dependent variable is total debt minus the firm's cash holdings, the quantity divided by the market value of the firm.

	All Firms					Firms With				
	1	2	3	4	Deep var = debt-cash 5	Debt > 0 6	Profits > 0 7	Bond Rating 8	Invest. Grade 9	Growth > 3.6% 10
MTR w/future grants		0.15	0.18	0.15	0.17	0.20	0.22	0.27	0.35	0.20
		(0.06)	(0.02)	(0.08)	(0.05)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
MTR w/future grants	0.21									
(Value Line)	(0.01)									
S&P dummy		0.06								
		(0.01)								
Stock volatility			−0.12							
			(0.24)							
Option deductions/Assets				−0.09						
				(0.10)						
N	131	147	147	147	147	130	120	100	72	101

firms (e.g., unprofitable/low-tax/low-debt versus profitable/high-tax/high-debt), or whether the tax effects also occur for subsets of somewhat homogeneous firms for which theory predicts there should be tax effects.

The sixth column investigates the 130 firms that report positive debt. We test whether option-affected tax rates provide a positive incentive to use debt for these firms. The tax coefficient in the sixth column (from an OLS regression) indicates that high tax-rate firms do indeed use more debt than low tax-rate firms.

In the seventh column, we examine tax effects for the 120 firms that were profitable in 2000, to make sure that our overall results are not driven strictly by profitable/high-tax firms using more debt than loss/low-tax firms, perhaps for nontax reasons (like accessibility to debt markets). The next two columns further explore the accessibility of debt markets by considering firms that have an S&P bond rating (100 firms in column eight) or have an investment grade bond rating (72 firms in column nine). For all three subsets of these firms, we find a positive and significant tax variable. Finally, in the far right column we examine the 101 firms that have annual growth in taxable income of at least 3.6% (the sample mean). Again, the tax variable is positive and significant.

Overall, the results in Tables V and VI indicate that taxes exert a positive effect on the use of debt and that options use exerts a negative effect. These results are robust to a number of different specifications and subsamples.

D. The Relation between Stock Option Deductions and Debt Conservatism

The preceding sections link stock options and debt policy by documenting improved statistical power in detecting tax effects when MTRs incorporate option deductions. In this section we examine a direct measure of debt conservatism and test whether firms that appear to have the most unused debt capacity (when option deductions are ignored) use option deductions to reduce tax liabilities.

Graham (2000) develops a measure of debt conservatism that he refers to as “kink.” Kink measures the proportion by which a firm could increase interest deductions without experiencing reduced marginal tax benefits for interest deductions. For example, consider a firm with EBIT of $2 million or more in every state of nature. If this firm has interest expense of $0.5 million (and we ignore carryforwards and carrybacks), it has a kink of 4.0, because it could quadruple interest deductions and still enjoy the full tax-reducing benefit of interest deductions in every state. (That is, even if it quadruples interest, the firm will not experience a tax loss in any state, so all tax benefits are enjoyed in the current year). Graham notes that many large profitable firms, which presumably face small costs of debt financing, have large kinks and appear to potentially be underlevered. Graham’s analysis, however, does not incorporate option deductions.

We calculate kink for our sample firms based on preoption income. (For computational reasons, we restrict the maximum kink to 8.0, as in Graham (2000).) The median (mean) kink is 8.0 (5.3) for our sample, which appears to indicate debt conservatism. However, we uncover evidence consistent with conservative firms (i.e., those with large kinks) substituting option deductions in place of interest. The Pearson correlation in Table IV between kink and reduction in MTR is −0.23 (significant at the 0.01 level), indicating that option deductions have the largest effect on MTRs for firms with large kinks (i.e., firms that appear to have the most unused debt capacity when option deductions are ignored). Similarly, the Pearson correlation between option deductions/value and interest/value is −0.28, which is consistent with firms substituting between option deductions and interest. Finally, when we recalculate kink based on EBT that subtracts options deductions, the mean kink falls from 5.3 to 4.3 (though the median kink remains at 8.0). The fact that the mean kink falls by one-fifth indicates the importance of the economic effect of stock option deductions on capital structure.

Overall, this evidence is consistent with firms that appear to be debt-conservative (when options are ignored) using option deductions heavily in place of interest. However, the large mean kink of 4.3 (even after option deductions are considered) indicates that employee stock option deductions offer only a partial explanation for the conservative use of debt. Additional research is needed to more fully understand the apparently conservative debt policy at many firms.

V. Conclusions

The tax deduction for nonqualified employee stock options is unusual. The company has little control over its timing or amount. Instead, the corporate deduction is delayed until employees choose to exercise options. The amount of the deduction is determined by the firm's stock price years after the options are granted. This paper develops an approach for evaluating the complex and uncertain tax benefits associated with employee stock options, impounds the corporate tax savings in MTRs, and assesses the effects of the option deduction on debt policy.

Incorporating option information from financial statement disclosures into Graham's (1996) MTR simulations, we compute MTRs that take into account option deductions. We then compare these firm-specific rates with companies' debt levels in an attempt to assess the relation between tax shields associated with leverage and tax shields associated with option compensation.

We find that employee stock options substantially reduce corporate taxes both for the industrial S&P 100 and the high-technology Nasdaq 100. For the more option-intensive Nasdaq 100, stock options dramatically reduce estimated MTRs, with the median rate tumbling from 31% to 5%. Consistent with the concerns raised in Hanlon and Shevlin (2002), our findings raise doubts about the usefulness of conventional MTRs, which ignore stock option deductions. Unfortunately, developing MTRs that impound option deductions from public sources is costly because the option data must be hand-collected from financial statements. Because scholars, policymakers, practitioners, and analysts, among others, need MTRs for option-intensive companies, future research should consider developing a low-cost method of estimating MTRs that incorporates the effects of stock option deductions.

We document a positive relation between leverage and postoption MTRs. Moreover, we find that firms that use little debt also use options extensively. These results provide at least a partial explanation for conservative debt usage at highly profitable, option-intensive firms, such as Microsoft and Dell. By presenting evidence that options provide an important nondebt tax shield that substitutes for interest in the spirit of DeAngelo and Masulis (1980), this paper extends our understanding of the role of taxes in financial decisions.

Going forward, it appears likely that accounting standard setters will require the expensing of stock options and that some firms may substitute with other forms of compensation like restricted stock. However, firms will still face the same basic issues we address in this paper. If options are expensed, or if companies move away from options and instead use restricted use restricted stock, compensation deductions should be easier to identify. However, future researchers will still have to wrestle with many of the issues we raise such as how to adjust historic data for the use of compensation options and, to a lesser extent, how to deal with issues related to the timing of the deduction.

Appendix: Microsoft's Stock Option Plan Footnote for the Year Ended June 30, 2000

The company has stock option plans for directors, officers, and employees, which provide for nonqualified and incentive stock options. Options granted prior to 1995 generally vest over four and one-half years and expire 10 years from the date of grant. Options granted during and after 1995 generally vest over four and one-half years and expire seven years from the date of grant, while certain options vest either over four and one-half years or over seven and one-half years and expire after 10 years. At June 30, 2000, options for 341 million shares were vested and 734 million shares were available for future grants under the plans.

Stock options outstanding were as follows:

		Price per Share	
	Shares	Range	Weighted Average
Balance, June 30, 1997	956	$0.56–$29.80	$7.86
Granted	138	16.56–43.63	31.28
Exercised	(176)	0.56–31.24	4.64
Cancelled	(25)	4.25–41.94	14.69
Balance, June 30, 1998	893	0.56–43.63	11.94
Granted	78	45.59–83.28	54.62
Exercised	(175)	0.56–53.63	6.29
Cancelled	(30)	4.25–74.28	21.06
Balance, June 30, 1999	766	0.56–83.28	23.87
Granted	304	65.56–119.13	79.87
Exercised	(198)	0.56–82.94	9.54
Cancelled	(40)	4.63–116.56	36.50
Balance, June 30, 2000	832	0.56–119.13	41.23

For various price ranges, weighted average characteristics of outstanding stock options at June 30, 2000 were as follows:

	Outstanding Options			Exercisable Options	
Range of Exercise Prices	Shares	Remaining Life (Years)	Weighted Average Price	Shares	Weighted Average Price
$0.56–$5.97	133	2.1	$4.57	127	$4.53
5.98–13.62	104	3.0	10.89	84	10.83
13.63–29.80	135	3.7	14.99	77	14.83
29.81–43.62	96	4.5	32.08	39	31.98
43.63–83.28	198	7.3	63.19	14	54.64
83.29–119.13	166	8.6	89.91	–	–

The company follows Accounting Principles Board Opinion 25, Accounting for Stock Issued to Employees, to account for stock option and employee stock purchase plans. An alternative method of accounting for stock options is SFAS 123, Accounting for Stock-Based Compensation. Under SFAS 123, employee stock options are valued at grant date using the Black–Scholes valuation model, and this compensation cost is recognized rateably over the vesting period. Had compensation cost for the company's stock option and employee stock purchase plans been determined as prescribed by SFAS 123, pro forma income statements for 1998, 1999, and 2000 would have been as follows:

	1998		1999		2000	
Year Ended June 30	Reported	Pro Forma	Reported	Pro Forma	Reported	Pro Forma
Revenue	$15,262	$15,262	$19,747	$19,747	$22,956	$22,956
Operating expenses:						
Cost of revenue	2,460	2,603	2,814	3,013	3,002	3,277
Research and development	2,601	2,963	2,970	3,479	3,775	4,817
Acquired in-process technology	296	296	–	–	–	–
Sales and marketing	2,828	2,977	3,231	3,438	4,141	4,483
General and administrative	433	508	689	815	1,009	1,243
Other expenses	230	230	115	115	92	92
Total operating expenses	8,848	9,577	9,819	10,860	12,019	13,912
Operating income	6,414	5,685	9,928	8,887	10,937	9,044
Investment income	703	703	1,803	1,803	3,182	3,182
Gain on sales	–	–	160	160	156	156
Income before income taxes	7,117	6,388	11,891	10,850	14,275	12,382
Provision for income taxes	2,627	2,369	4,106	3,741	4,854	4,210
Net income	$4,490	$4,019	$7,785	$7,109	$9,421	$8,172
Diluted earnings per share	$0.84	$0.75	$1.42	$1.30	$1.70	$1.48

The weighted average Black–Scholes value of options granted under the stock option plans during 1998, 1999, and 2000 was $11.81, $20.90, and $36.67 respectively. Value was estimated using a weighted average expected life of 5.3 years in 1998, 5.0 years in 1999, and 6.2 years in 2000, no dividends, volatility of 0.32 in 1998 and 1999 and 0.33 in 2000, and risk-free interest rates of 5.7%, 4.9%, and 6.2% in 1998, 1999, and 2000.

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