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EMPLOYEE STOCK OPTIONS, CORPORATE TAXES AND DEBT POLICY

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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, the median marginal tax rate is 31 percent when option deductions are ignored but falls to 5 percent when one accounts for the deductions. For S&P firms, however, option deductions do not affect marginal tax rates to a large degree. In the spirit of DeAngelo and Masulis (1980), option deductions are important nondebt tax shields that can affect corporate policies. We find evidence consistent with option deductions substituting for interest deductions in corporate capital structure decisions. This evidence explains in part why some firms appear to be underlevered.

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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. The purpose of this paper is to assess the impact of these deductions on marginal tax rates and corporate decisions, such as 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. Desai (2002) reports that the top five officers of the largest 150 U.S. firms received options with grant values exceeding $16 billion in 2000, a tenfold increase over the decade. He estimates that proceeds from option exercises averaged 29 percent of operating cash flows in 2000, up from 10 percent in 1996. Option compensation has spread beyond technology stocks. The National Center for Employee Ownership estimates that the number of employees receiving stock options grew from less than one million in 1990 to approximately 10 million in 1999, with only a third of these workers in high-technology firms (http://www.nceo.org/library/option_myths.html).

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. Ciprianao, 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 percent of operating cash flows in 2000, up from 8 percent in 1997. Sullivan (2002) adds that option tax deductions in 2000 exceeded net income for eight of the 40 largest U.S. companies (as determined by market capitalization): Microsoft, American Online,

[1] Throughout the paper, we use the Scholes, et al. (2001) definition of the marginal tax rate: the present value of current and future tax liabilities generated by an additional dollar of current income.

Cisco Systems, Amgen, Dell Computer, Sun Microsystems, Qualcomm, and Lucent. Furthermore, companies as diverse as General Electric, Pfizer, Citigroup, and IBM deducted over $1 billion in stock option compensation in 2000.

We confirm that employee stock option deductions substantially reduce corporate tax payments. We estimate that in 2000 stock options reduced 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 percent of aggregate pretax income. For the Nasdaq 100 companies (which are more option-intensive), aggregate deductions exceed aggregate pretax income. Not surprisingly, with corporate tax savings of these magnitudes, employee stock option deductions are attracting considerable political scrutiny, including current legislation to limit the tax deductions to the amount expensed for book purposes (e.g., Senate bill 1940, Ending the Double Standard for Stock Options Act, introduced February 13, 2002).[2]

This study, however, focuses primarily on the effect of employee stock options on marginal tax rates (MTRs) because MTRs often affect economic decision making. For our sample, the median marginal tax rate falls from 34 percent when we ignore option deductions, to 26 percent when we include options in the analysis. For Nasdaq firms, the deductions comprise such a large proportion of pre-option income that the median MTR tumbles from 31 percent to 5 percent when option deductions are included in the tax rate calculation. We isolate the effect of three classes of options on the MTR : those already exercised, those granted but not yet

[2] Enron's recent failure has contributed to the growing attention on the magnitude of stock option deductions. For example, the *New York Times* (February 7, 2002) states, "Enron's collapse has also renewed lawmakers' interest in how companies that issue stock options do not have to deduct their costs under accounting rules. But these companies can and do take sizable tax deductions every year in which large blocks of options are exercised by executives. As a result, many of the nation's largest and most profitable companies have escaped paying income taxes in recent years. From 1996 to 2000, for example, Enron eliminated taxes of $625 million through aggressive stock option grants."

exercised, and those yet to be granted. Each class of options contributes to the overall reduction in MTRs.

Such large reductions in marginal tax rates can have important implications for corporate decisions that hinge on MTRs, such as debt policy. Previous research has investigated whether taxes affect financing decisions, often with mixed results (see Graham (2002) for a review). Some conclude that high-MTR firms appear to carry insufficient debt in their capital structure (Graham (2000)). Hanlon and Shevlin (2002), however, point out that these previous studies ignore tax deductions from stock option exercise. Employee stock options can influence debt policy when they are large enough to affect marginal tax rates. For example, DeAngelo and Masulis (1980) argue that companies substitute between debt and nondebt tax shields (such as option deductions) when determining their optimal capital structure.

In our sample, debt ratios and MTRs are not pairwise correlated when we ignore option deductions in the construction of marginal tax rates. 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 also provide a partial answer to the puzzle of why some firms currently appear to be underlevered (Graham (2000))—they are less underlevered once option deductions are considered.

Three important conceptual issues should be addressed by any study that investigates the interaction between stock option deductions and corporate MTRs. First, current-period MTRs can be affected by already-exercised options (because they affect the level of taxable income and possibly tax loss carryforwards), the overhang of already-granted, but not-yet-exercised, options (because these options can create losses in the future that affect current-period MTRs via the carryforward and carryback features of the tax code), and not-yet-granted options. All studies of which we are aware only consider one of these 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.

A second important issue is related to using financial statement data to infer tax implications for stock options. While firms are required to disclose the tax benefits attributable to employee stock options in the financial statements, Hanlon and Shevlin (2002) stress that using the reported "tax benefits from stock options" numbers is problematic. One difficulty arises because firms that avoid recognizing stock option expense on the income statement are also prohibited from allowing stock option deductions to reduce income tax expense in financial statements. The underlying logic is that, since the original charge did not reduce pretax income, the tax benefit at exercise should not decrease tax expense. As a result, a firm can consistently report high tax expense (on financial statements) and never pay any taxes (on tax returns) because the difference never reverses. Moreover, Hanlon and Shevlin report that only 63 of the Nasdaq 100 report "tax benefits from options" on their income statement in 1999. Even when it is reported, another difficulty arises in that the tax benefit number is not consistently reported across firms; reporting differences are most acute when comparing profitable to unprofitable

firms. We avoid these issues by following Hanlon and Shevlin's advice and using the detailed information on grants and exercises found in the financial footnotes. This information is reported consistently across firms.

The final conceptual issue is related to the uncertainty of if and when not-yet-exercised options will lead to corporate tax deductions. Corporations have little control over employee exercise behavior and therefore over the amount of option deductions in any given year. This year's nonqualified grants produce no deductions until the options are exercised in the future, while this year's exercises relate to grants from several years ago. Moreover, because share prices are volatile and options have long lives (most often ten years), today's grants can generate huge deductions in the future or no deductions at all, depending on the stock price path.

In general, the stochastic nature of stock option deductions can substantially complicate computations of estimated marginal tax rates and consequently any corporate decisions in which taxes are relevant. The stock price path and employee exercise decisions are difficult to predict and are largely outside of the control of the corporation. For efficient tax and financial planning, a manager would need to factor in the probabilities and amounts of future option deductions. In this spirit, we explicitly implement a simulation approach for considering stock option deductions (described in detail in Section I). Specifically, using information on stock options, stock return volatility, dividends, and expected returns, we modify the Graham (1996) simulation technology. We combine expected deductions with simulated taxable income to arrive at probability-weighted estimates of future taxable income and MTRs. The analysis is very similar to the approach we envision a corporate manager would undertake to make decisions based on expected marginal tax rates. To our knowledge, ours is the first study to take the ex ante

perspective of explicitly incorporating pre-exercise option information into marginal tax rate estimates.

In sum, the first half of our paper investigates in detail whether and how option deductions affect corporate marginal tax rates. The second half analyzes whether option deductions affect corporate debt policy decisions, and more generally, the issue of why some firms appear underlevered. The paper most similar to the second half of our paper is 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 marginal tax rates, or the effect of options on marginal tax rates. These omissions are a shortcoming because option deductions should only affect capital structure decisions to the extent that they affect MTRs. Second, they measure option deductions with the "tax benefits" number, even though Hanlon and Shevlin (2002) report numerous problems with this approach. Third, Kahle and Shastri do not consider two classes of options that we consider: already granted but not-yet-exercised and not-yet-granted. Finally, Kahle and Shastri address neither the uncertainty of option exercise timing, nor more generally how option deductions interact with the dynamic aspects of the federal income tax code.

Besides 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 non-executive employees, presumably because the firms would rather use traditional forms of compensation that lead to an immediate compensation deduction. Our paper does not investigate whether taxes affect the choice between

various forms of compensation, but does indicate that firms consider the tax effects of compensation when deciding on corporate capital structure. Second, our paper is related to the literature that investigates how tax managers optimize corporate tax policy (e.g., Scholes et al (2001)). 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 the next section, we discuss our empirical approach in detail and describe the data. Section II analyzes the effect of option deductions on corporate marginal tax rates. Section III examines the interaction between option deductions and corporate debt policy. Section IV presents closing remarks and points out that, as large as corporate deductions are, the net effect of stock option compensation likely is a revenue gain for the U.S. Treasury because of the income taxes that employees pay at exercise.

I. 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 proportion of the economy and pay substantial taxes.[4] Analysis of S&P 100 firms provides insight about traditional, stable industrial firms. The 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. We are unable to locate data for three firms, which reduces

[3] Strictly speaking, our results are consistent with managers trading off interest and option deductions in 2000. It would be interesting for future research to investigate whether managers trade off non-option deductions with interest in eras where option deductions are less prominent.

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

the sample to 190 companies.[5] We limit the sample to these firms because (i) hand-collecting stock option data in the financial statement footnotes is costly, and (ii) our simulation method (described below) is less likely to produce reliable results for small, unstable firms.

We envision a scenario in which a manager assesses his firm's marginal tax rate 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.[6]

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 likely did not envision the magnitude of the eventual stock option deductions when they granted the options years earlier. Nonetheless, regardless of previous expectations, managers likely found themselves at year-end 2000 facing marginal tax rates similar to those estimated in this study. In other words, even if they did not expect the options granted in the early and mid-1990s to shelter as much taxable income as they did, this situation is the one they faced at year-end 2000. In addition, the bull market of the 1990s means that the exercise of stock options for years to come has the potential to trigger large tax deductions, even if stock returns are flat for the next several years.[7] Regardless, the approach that we develop in this study should be useful in any year for incorporating stock option deductions in marginal tax rate calculations.

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

[6] 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 have year-ends between January and May 31, 2001.

[7] To get a feel for the effects of the stock market run-up, we perform a robustness check in which we assume stock prices and returns, as well as grant and exercise prices, are only half what they actually were. Even with dampened

B. Overview of Simulation Procedure

The simulation procedure that we use to estimate 2000 marginal tax rates incorporates dynamic features of the tax code including tax loss carrybacks and carryforwards (Shevlin (1990) and Graham (1996)). The first step in the algorithm calculates the aggregate present value tax liability from 1998 (to account for the two-year carryback period) to 2020 (to account for the 20-year carryforward period). In the second step, we add $1 to earnings in 2000 and recalculate the present value tax liability from 1998 to 2020. The extra $1 added to 2000 can result in additional taxes owed in 2000, in some year between 2001 and 2020, or not at all (if losses are sufficient to offset all current and future profits). The MTR in 2000 is the incremental present value of taxes owed from earning the extra dollar in 2000 (i.e., the tax liability calculated in step two minus that from step one, discounted at Moody's average corporate bond yield), even if these taxes are not paid until some later year. For each firm, we repeat the steps just described 50 times to obtain 50 estimates of the current-period MTR. The expected MTR is the mean tax rate among these 50 estimates.

Capturing these dynamic features of the tax code is important in our analysis because past and future income and option exercises can affect our variable of interest, the current-period corporate marginal tax rate. For example, assume that a firm with option deductions larger than income during the past few years accumulates a tax loss that it can carry forward to entirely offset income for the next four years and a portion of income five years hence. Adding a dollar to current-period income reduces this carryforward by $1 and increases tax liabilities in year five by $1($\tau_C$), where τ_C is the statutory corporate marginal income tax rate. The current period MTR

stock prices, the sheer number of options granted and exercised is such that the mean tax rate is only 60 basis points higher than the base case tax rate we report below.

therefore equals $\tau_C/(1+r)^5$, where r is the discount rate. As another example, consider a firm that pays taxes in 2000 but anticipates enormous option deductions in 2001. To keep things simple, assume that these future deductions lead to a tax loss in 2001 big enough that the firm receives a refund for taxes paid in 2000 and also offsets all profits in the foreseeable future. In this example, the firm's MTR in 2000 is $\tau_C - \tau_C/(1+r)$.

These examples demonstrate that to estimate the current-period MTR, we need to forecast future taxable income (discussed in Section C), future grant and exercise behavior (Section D), and future stock prices (Section E).

C. Estimating Historic and Future Income (Ignoring Option Deductions)

In this section we discuss the task of measuring income ignoring option deductions. In the next section we discuss how we subtract historic and expected future option deductions to derive taxable income.

We implement a variation of the algorithm used in Shevlin (1990) and Graham (1996) to simulate taxable income before option deductions. 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, pretax earnings from Compustat, adjusted for deferred taxes, measure taxable income before stock option deductions.[8] Additionally, since our data are from financial statements, this measure of taxable income faces the usual limitations when book

[8] Stock option deductions can show up in our pre-option measure of taxable income if they affect deferred taxes. This result 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 that 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 65 basis points lower in this "no deferred taxes adjustment" run but the qualitative implications are unchanged.

numbers are used to approximate tax payments, including book-tax differences in consolidation and recognition of foreign profits.[9]

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.[10] Using these growth rate and volatility estimates, we forecast pre-option taxable income for the next 20 years.

D. Including Historic and Future Options Exercises

Since 1996, Statement of Financial Accounting Standards 123 has required firms to include in their financial footnotes (a) a description of option terms, (b) the number of options, weighted average strike price, and remaining contractual life for options outstanding at the end of the period, (c) three years of exercise, grant and cancellation history (number of shares and weighted average price), and (d) 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. Firms have relatively little discretion 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.[11] For illustrative purposes, the

[9] See Plesko (1999) for a comparison of the actual marginal tax rate per the tax return (ignoring carryovers) with estimated tax rates based on financial statement data (incorporating carryovers), such as the simulation technique used in this paper.

[10] 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 and volatility to lie within the respective industry interquartile ranges, nor if we set each firm's growth and volatility equal to industry medians.

[11] 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

appendix includes Microsoft's stock option footnote for the year ended June 30, 2000. Hall and Leibman (2000) find that 95 percent of all stock options are nonqualified, so we make the simplifying assumption that all options reported in the footnote are nonqualified.[12]

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.[13]

Incorporating historic option deductions into our analysis is straightforward: we subtract the historic employee option deductions from the 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 experimented with also gathering historic options data for 1995, 1996, and 1997 for a random sample of eight firms but the cost of hand-gathering the data was large and the benefit small (these extra data barely affected our results).[14]

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in the respective plan. Twenty-eight companies disclose a range for Black-Scholes assumptions, and five disclose a range of exercise prices rather 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 90 basis points, but the overall implications of our study do not change.

[12] There is a rare situation where incentive stock options can provide a tax deduction. If an employee undertakes a "disqualifying disposition," the tax treatment for an incentive stock option is identical to a nonqualified stock option. Matsunaga, Shevlin, and Shores (1992) discuss the unusual conditions following the Tax Reform Act of 1986 that led some firms to provide incentives for employees to disqualify.

[13] For example, using the Microsoft footnote disclosure in the appendix for the year ended June 30, 2000, the estimated 2000 tax deduction for stock options is $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.

[14] In our approach, we first forecast taxable income based on historic data (ignoring options, as described in Section C) and then subtract the effects of options in a second step (as described in Section D). An alternative approach would be to subtract the effect of options from all historic data (up to 20 years of data) and then forecast post-

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 (2000) report that early exercise of employee stock options is common, with much of the exercise occurring about halfway through the option's life, and that exercise tends to be spread smoothly over time. Thus, we use the disclosed expected option life as our estimate of when average exercise will occur and assume exercise is spread smoothly over a period beginning two years before that year and ending two years after that year.[15]

Some stock price paths imply that option exercise is not optimal because the market price is close to or below 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 percent 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 percent (or until expiration).[16]

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options income into the future. Unfortunately, because the stock option disclosures have only been required since 1996, we cannot adjust the estimates of taxable income in all prior years, so this alternative approach is infeasible.

[15] 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 gathered 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 10 basis points higher than what we report below, and overall qualitative results are unchanged.

[16] 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 percent during those years. If they are not in the money by 15 percent, exercise is deferred until the first year in which they are in-the-

Future option deductions can affect the current-period marginal tax rate in two ways. First, if they are exercised in the next two years and are sufficiently large 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 on an extra dollar earned 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 on an extra dollar earned in 2000, thereby reducing present value tax liabilities and 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 only occurs for firms with average option life of four years or less) or, for currently nontaxed firms, 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.[17] The growth factor is based on a given firm's pre-option income growth (bounded between the 25th and 75th percentiles for income growth rates of other firms in the same 2-digit SIC code).[18] The strike price for a given firm-year's newly granted options is assumed to be the stock price for that firm-year. In the next section we describe how the stock price is determined.[19]

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money by 15 percent. In 2010 (the presumed date of expiration), all options are exercised if they are in-the-money by any amount.

[17] For example, the Microsoft footnote disclosure in the appendix reports grants (cancellations) of 138 (25) million in fiscal year 1998, 78 (30) million 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.

[18] In unreported analysis, 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 future options grant numbers are conservative.

[19] In addition, if firms increasingly substitute options for compensation that is currently expensed (e.g., salary), then our estimates of future pre-option income will be understated. This understatement will occur if in the future firms were to rely more heavily on non-expensed options. The simulation, however, uses past accounting earnings (with

Finally, throughout the study we ignore repricing, i.e., reducing the strike price of already granted options. To the extent firms are committed to a policy of repricing during downward price movements, this assumption understates future option deductions.

E. 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 for each of the 50 simulations of the future described in Section A. 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 3.0 percent (which is consistent with recent estimates of the risk premium in Fama and French (2001)).[20] We are interested in capital appreciation in stock price, so we subtract the firm-specific dividend-yield from each firm's total return.

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 percent). 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 C. We assume that unexpectedly high earnings are accompanied by proportionally

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its heavier reliance on expensed compensation) to forecast future pre-option earnings. The effect on taxable income of this underestimate of future accounting earnings will be balanced by the underestimate of future employee stock option deductions.

positive expected stock returns. For example, consider a case in which earnings were expected to grow at 10 percent and stock price was expected to grow at 12 percent. Suppose in a given simulation we end up on a path with earnings growing 15 percent in the first year (50 percent higher growth rate than expected). To link the two series, we assign a mean stock price growth on that path of 18 percent for that year (50 percent higher than expected). This adjustment modifies the expected stock return in a way that implies a link between earnings and returns.

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 60 basis points lower than those reported in the base case below). Moreover, our qualitative results do not change if we assume that stock prices increase 12 percent annually for all firms.

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.[21]

In our approach, we use historic data to estimate income growth (as described in Section C) and a modified CAPM expected return (as described in this section). 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 the high and low "four year ahead target stock prices." Using these alternative earnings and stock growth rates

[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 30 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.

yields mean MTRs that are only 30 basis points higher than those we report below and no difference in the overall qualitative results.

II. 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 the Nasdaq 100 samples. For both groups, the average expected option life is close to five years, although it is slightly shorter for Nasdaq firms. This expectancy is 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 percent. The small difference in the risk-free rate for the two samples probably reflects differences in year-ends (because risk-free rates should be similar for firms with common year-ends), with non-calendar year-ends more common for Nasdaq firms.

Dividend yield averages 1.5 percent for S&P 100 firms with most firms paying dividends. Conversely, few Nasdaq 100 firms pay dividends. The mean dividend yield is 0.1 percent and the 75th percentile is zero. Annual stock return volatility is higher for Nasdaq 100 firms, with a mean volatility of 73 percent versus 36 percent 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 three times larger than that for Nasdaq 100 firms. However, there is substantial overlap between the two distributions, with the 75th percentile of Nasdaq

[21] 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

firms being much 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 (5.3 percent) than for the S&P firms (4.7 percent). The 75th percentiles are about 11 percent for both 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 –2.5 percent for the Nasdaq firms versus 1.5 percent for the S&P firms. Nasdaq firms tend to use less debt in their capital structure, with a mean (median) debt ratio of 6.4 percent (0.9 percent) versus 18.2 percent (14.4 percent) 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 corporate marginal tax rate (i.e., the effect of all historic and future exercises). The histogram shows marginal tax rates for all 190 firms in our sample, with and without the effects of options. Options cause a significant shift in marginal tax rates. Before options, 24 percent of the sample face marginal tax rates of less than 10 percent while after considering options, 35 percent face such rates. Similarly, before options 65 percent of the sample firms face marginal tax rates above 30 percent as compared with 46 percent 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. Note that seven firms are in both the Nasdaq 100 and the S&P 100. For the remainder of the paper we classify these firms as S&P firms, leaving us with 99 firms in the S&P sample and 91 in the Nasdaq sample.

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rate is only 15 basis points different from that reported below in the base case.

B. Tax Effects for S&P 100 Companies

Table III presents evidence on the effects of option deductions on marginal tax rates, segregated by sample. The first row contains estimated marginal tax rates for 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 difference being that we bound income growth and volatility to lie within the 25th and 75th industry percentiles. The median marginal tax rate for the S&P 100 firms in 2000 is the top statutory rate of 35 percent while the mean is 29 percent, which is consistent with prior studies that show clustering at the upper end of the statutory rates. The 25th percentile MTR is 32 percent, 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 (i.e., 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 marginal tax rates. 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 marginal tax rates. In the fourth row of Table III, when all option deductions are considered (including future grants and future exercises), the median marginal tax rate is still 35 percent. For the 25th percentile, the estimated marginal tax rate drops to 26 percent from 32 percent.

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

Even though employee stock option deductions do not substantially reduce the marginal tax rate 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 roughly $64 billion, which is substantial even for large industrials. 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 percent of pretax income for the median firm, 12 percent for the 75th percentile, and 111 percent 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 less profitable firms, the tax savings do not translate into significantly lower marginal tax rates for the typical (highly profitable) S&P 100 firm. Although option deductions slash their tax bills, only about one-fourth of S&P 100 firms have enough deductions to (i) fully offset the current year's pre-option income and also eliminate the past two years of taxable income, (ii) generate losses in 2001 and 2002 that can be carried back to fully offset income in 2000, or (iii) for firms that are nontaxable in 2000, delay when taxes are eventually paid on an extra dollar of

income earned in 2000. One or more of these conditions must be met for option deductions to reduce marginal tax rates.

C. Tax Effects for Nasdaq 100 Companies

Options dramatically affect the marginal tax rates of Nasdaq 100 companies. The median marginal tax rate before options is 31 percent and the mean is 20 percent (see the bottom panel in Table III), suggesting that Nasdaq firms face relatively high marginal tax rates 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 percent to 15 percent. Incrementally considering options that are already granted but not yet exercised reduces the median MTR from 15 percent to 9 percent. Considering all forms of option deductions, including those from future grants, reduces the median MTR all the way down to 5 percent. Considering all deductions, the 75th percentile drops from 35 percent to 26 percent, indicating that option deductions affect most of the Nasdaq 100 firms.

The proportion of Nasdaq firms with a marginal tax rate less than 0.05 increases from 33 percent to 50 percent. This increase implies that half of the Nasdaq 100 firms anticipate paying very little 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 marginal tax rates is 8 (3) percent. The size of the decline is limited by the fact that marginal tax rates 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, 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 this deductions figure does not eliminate all taxes for the Nasdaq 100 because some firms have pre-option 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 percent of Nasdaq firms face marginal tax rates exceeding 0.30; after considering options, only 18 percent do. Almost 60 percent of the Nasdaq 100 face post-option marginal tax rates below 10 percent and almost 30 percent face marginal tax rates 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 interest. After considering option deductions, only a minority of Nasdaq firms find debt tax-advantageous.

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

The preceding section indicates that the effects of stock options on marginal tax rates 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 pre-interest marginal tax rates and various measures of debt in the capital structure, specifically, debt-to-market value,

debt-to-assets, and interest-to-market value. We examine pre-interest 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 can also reduce the MTR, which induces a spurious negative correlation between debt ratios and tax rates. This endogeneity can be avoided by using pre-interest 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 (Spearman) correlation between the debt variables and conventional pre-interest marginal tax rates (MTR w/o options), i.e., before the effects of interest and options. For all three measures, for both Spearman and Pearson correlations the coefficients vary in sign and are insignificant (except for the Pearson correlation on interest/value, which has the wrong sign). These correlations provide no evidence that capital structure is correlated with marginal tax rates for our sample (when we ignore options deductions).

The second row and column show the relation when the computation of pre-interest marginal tax rates is modified to include all employee stock option deductions (MTR w/ 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 marginal tax rates.[22]

[22] 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)).

The third row and column present the correlations between the change in pre-interest marginal tax rates resulting from options (ΔMTR w/ future grants) and the other variables. Two points are worth noting. First, the correlation between the decrease in rates and the post-option marginal tax rates is strongly positive, indicating that options have a significant effect on marginal tax rates. 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, marginal tax rates and debt, Table V presents tobit regressions with debt-to-value as the dependent variable. 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 a financial institution is problematic, we delete the 34 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 156 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 w/o options and MTR w/ future grants, respectively. Like the correlation coefficients presented in Table IV, the coefficient on the marginal tax rate variable, when all stock options are ignored, is insignificant. The coefficient on the marginal tax rate variable, when stock options are considered, is significantly and positively correlated with the debt ratio at the 0.01 level.

A number of nontax factors can affect debt policy, so it is important for us to control for these potential influences in a multivariate analysis. Controlling for such influences helps us isolate tax effects and minimize the possibility that our tax variable proxies for some other factor. For example, financially weak firms face lower tax rates and also might face barriers to borrowing and 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 marginal tax rates before options and debt 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 for 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 access to debt markets, which allows them to borrow more. We therefore expect a positive relation between debt ratios and firms size, which we measure with sales revenue.

Note that data are missing for at least one of these explanatory variables for nine observations, so the regressions that include control variables have 147 observations. Finally, though not shown in the tables, every regression specification includes five 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 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 pre-option tax rate, although it remains 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 w/ exercised options) is larger and more significant than the no-options tax rate (p-value of 0.03). In the fifth and sixth 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.[23] The

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

increasing significance of the tax variables highlights the influence of stock option deductions on MTRs and debt policy.

The rightmost column of 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 w/ future grants. By using two tax variables, we are able to examine separately the effects on debt policy of traditional tax effects, as well the incremental effect of options. In this specification, the MTR w/o options tax variable is significant at the 0.01 level, and the incremental effect of options is significant at the 0.05 level, and both coefficients have the expected sign. Thus, we conclude that taxes affect capital structure decisions for reasons unrelated to, as well as directly related to, deductions that result from employee stock options.

C. Robustness Checks

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). First, we examine the tax variable based on Value Line growth estimates, rather than using historical data to estimate income growth and the CAPM to estimate stock returns. The leftmost column of Table VI indicates that the Value Line tax variable coefficient is 0.21 (and significant at the 0.01 level), which is nearly identical to the base case results in Table V.

Second, we include an S&P dummy variable (second column of Table VI). Suppose the 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 should 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 0.05).

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 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 reacting solely to the size of the options. The positive coefficient on the tax variable (p-value of 0.07) provides some assurance that the effect of the options on the marginal tax rates has incremental value beyond merely identifying option-intensive firms.

The fifth through ninth 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 firms (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 fifth column investigates the 130 firms that clearly have access to debt markets. These firms all have at least some debt, and we test whether option-affected tax rates provide a positive incentive to use debt for these firms. The tax coefficient in the fifth column (from an OLS regression) indicates that high tax rate firms do indeed use more debt than low tax rate firms.

In the sixth 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 explore the accessibility of debt markets further by considering firms that have an S&P bond rating (100 firms in column seven) or have an investment grade bond rating (72 firms in column eight). For all three subsets of these firms we find a positive and significant tax variable. Finally, in the rightmost column we examine the 101 firms that have taxable income growth 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 sub-samples.

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 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." Without going into details, 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, 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 thus appear to be underlevered. Graham's analysis, however, does not incorporate option deductions.

We calculate kink for our sample firms based on pre-option income (for computational reasons, we restrict the maximum kink to 8.0, as in Graham (2000)). The median (mean) kink is 8.0 (5.33) 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 –0.24 (significant at 0.01 level), indicating that option deductions have the largest effect on marginal tax rates for 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 –0.54, 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 to 4.25 from 5.33 (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 debt conservative (when options are ignored) using option deductions heavily in place of interest. However, the large mean kink of 4.33 indicates that employee stock option deductions offer only a partial

explanation of why some firms appear underlevered. Additional research is needed to more fully understand the underleverage issue.

IV. 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. 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, uncertain tax benefits associated with employee stock options, impounding the corporate tax savings in marginal tax rates, and assessing the effects of the option deduction on an important corporate decision, debt policy.

Incorporating option information from financial statement disclosures into Graham's (1996) marginal tax rate simulations, we compute marginal tax rates that take account of 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 for both the industrial S&P 100 and the high-technology Nasdaq 100. For the more option-intensive Nasdaq 100, stock options dramatically reduce estimated marginal tax rates with the median rate tumbling from 31 percent to 5 percent. Consistent with the concerns raised in Hanlon and Shevlin (2002), our findings raise doubts about the usefulness of conventional marginal tax rates, which ignore stock option deductions. Unfortunately, developing marginal tax rates 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 marginal tax rates for option-intensive companies, future research should consider developing a low-cost method of estimating marginal tax rates that incorporates the effects of stock option deductions.

We document a positive relation between leverage and post-option marginal tax rates. Moreover, we find that firms that appear to use debt conservatively also use options extensively. These results provide at least a partial explanation for the limited debt at highly profitable, option-intensive firms, such as Microsoft and Dell. By presenting evidence that options provide an important non-debt tax shield, this paper extends our understanding of the role of taxes in financial decisions.

Finally, the fact that employee stock option deductions shelter corporate taxable income does not necessarily imply a revenue loss for the U.S. Treasury. When employees exercise in-the-money nonqualified options, they generate ordinary taxable income equal to the company's tax deduction, which is the standard tax treatment for compensation. Moreover, the individual revenue increase likely exceeds the corporate revenue loss for at least two reasons. First, the deduction sometimes expires unused by the corporation for lack of taxable income. Second, the individual likely is taxed at a high ordinary income tax rate because the additional income often pushes the taxpayer into a higher tax bracket. If option exercisers for our sample are in the highest individual tax bracket (39.6 percent in 2000), we estimate a net revenue gain of $15 billion from our sample of firms for the U.S. Treasury. This gain is equivalent to increasing the corporate tax rate by 7 percent.

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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
Canceled	(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
Canceled	(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
Canceled	(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 ratably 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:

Year Ended June 30	1998		1999		2000	
	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. 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 percent, 4.9 percent, and 6.2 percent in 1998, 1999, and 2000.

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. *Dividend yield* is dividends as a percentage of share price. *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).

S&P 100 in 2000

	Mean	Median	Std. Dev	25th Perc.	75th Perc.
Expected Life	5.22	5.00	1.64	4.15	6.43
Risk-Free Rate	6.10	6.20	0.50	5.88	6.46
Dividend Yield (%)	1.50	1.25	1.40	0.15	2.40
Annual Return Volatility	36.3	33.2	12.9	28.5	42.0

Nasdaq 100 in 2000

	Mean	Median	Std. Dev.	25th Perc.	75th Perc.
Expected Life	4.38	4.33	1.81	3.28	5.00
Risk-Free Rate	5.89	6.00	0.58	5.68	6.23
Dividend Yield (%)	0.09	0.00	0.48	0.00	0.00
Annual Return Volatility	73.2	72.0	25.7	55.0	91.5

TABLE II

Descriptive statistics on firm characteristics

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. *Beta* is the market-model beta as reported on CRSP.

S&P 100 in 2000

	Mean	Median	Std. Dev	25th Perc	75th Perc
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 (%)	18.2	14.4	15.6	7.4	25.5
Beta	0.98	0.98	0.53	0.56	1.33

Nasdaq 100 in 2000

	Mean	Median	Std. Dev	25th Perc	75th Perc
Asset ($M)	7,074	2,457	13,087	1,432	6,803
Market Equity ($M)	22,435	8,885	44,045	5,351	18,133
Return on Assets (%)	-0.2	5.3	38.3	-2.5	11.0
Debt/Value (%)	6.4	0.9	11.3	0.0	6.3
Beta	1.13	1.13	0.57	0.74	1.56

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. *MTR w/o options* is a simulated marginal tax rate, assuming there are no employee stock option deductions, based on earnings before tax (EBT). A simulated MTR measures the present value tax liability associated with earning an extra dollar of income in 2000, and accounts for the tax-loss carryback and carryforward features of the tax code. *MTR w/ exercised options* is the simulated rate except that historic deductions from options exercised in 1998, 1999, and 2000 are subtracted from EBT. *MTR w/ current grants* is the simulated marginal tax rate, with historic deductions and future deductions associated with already granted options deducted from EBT. *MTR w/ future grants* is the simulated marginal tax rate, with historic deductions, future deductions for already granted options, and deductions for not-yet-granted options deducted from EBT. 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 large reduction in the tax rate. *2000 Stock Option Deductions* is the dollar figure (in millions) of option deductions in 2000. *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 information for the 5^{th} , 25^{th}, 50^{th}, 75^{th}, and 95^{th} percentiles.

S&P 100 in 2000

	Mean	Std Dev	5%	25%	50%	75%	95%
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

	Mean	Std Dev	5%	25%	50%	75%	95%
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	0.33	0.35
MTR w/ current grants	0.14	0.13	0.00	0.00	0.09	0.27	0.35
MTR w/ future grants	0.12	0.13	0.00	0.00	0.05	0.26	0.35
ΔMTR w/ future grants	-0.08	0.12	-0.31	-0.13	-0.03	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

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 marginal tax rates and various measures of debt policy appear above (below) the main diagonal. *MTR w/o options* is a simulated marginal tax rate, assuming there are no employee stock option deductions, based on earnings before tax (EBT). *MTR w/ future grants* is the simulated marginal tax rate, with historic deductions, future deductions for already granted options, and deductions for not-yet-granted options deducted from EBT. Δ*MTR w/ future grants* is *MTR w/ future grants* minus *MTR w/o options*. *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. *Debt-to-assets* is total debt divided by total assets. *Interest-to-value* is debt interest divided by market value. *Deductions-to-value* is the dollar amount of option deductions in 2000 divided by market value. *Kink* in 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 156 firms included in the regression analysis. ***, **, * means statistically different from zero at the 0.01, 0.05, and 0.10 levels, respectively. 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***	0.45***
MTR w/ future grants	0.74***		0.44***	0.23***	0.12*	0.12*	-0.56***	0.26***
ΔMTR w/ future grants	-0.01	0.48***		0.30***	0.15**	0.37***	-0.45***	-0.24***
Debt-to-Value	0.10	0.34***	0.34***		0.89***	0.97***	-0.51***	-0.43***
Debt-to-Assets	0.09	0.26***	0.22***	0.89***		0.81***	-0.39***	-0.24***
Interest-to-Value	-0.08	0.25***	0.50***	0.97***	0.81***		-0.54***	-0.59***
Deductions-to-Value	-0.25**	-0.56***	-0.53***	-0.51***	-0.39***	-0.54***		0.13*
Kink	0.43**	0.32**	-0.16*	-0.29***	-0.18**	-0.49***	0.08	

TABLE V
Tobit regressions of debt-to-value on marginal tax rates and control variables

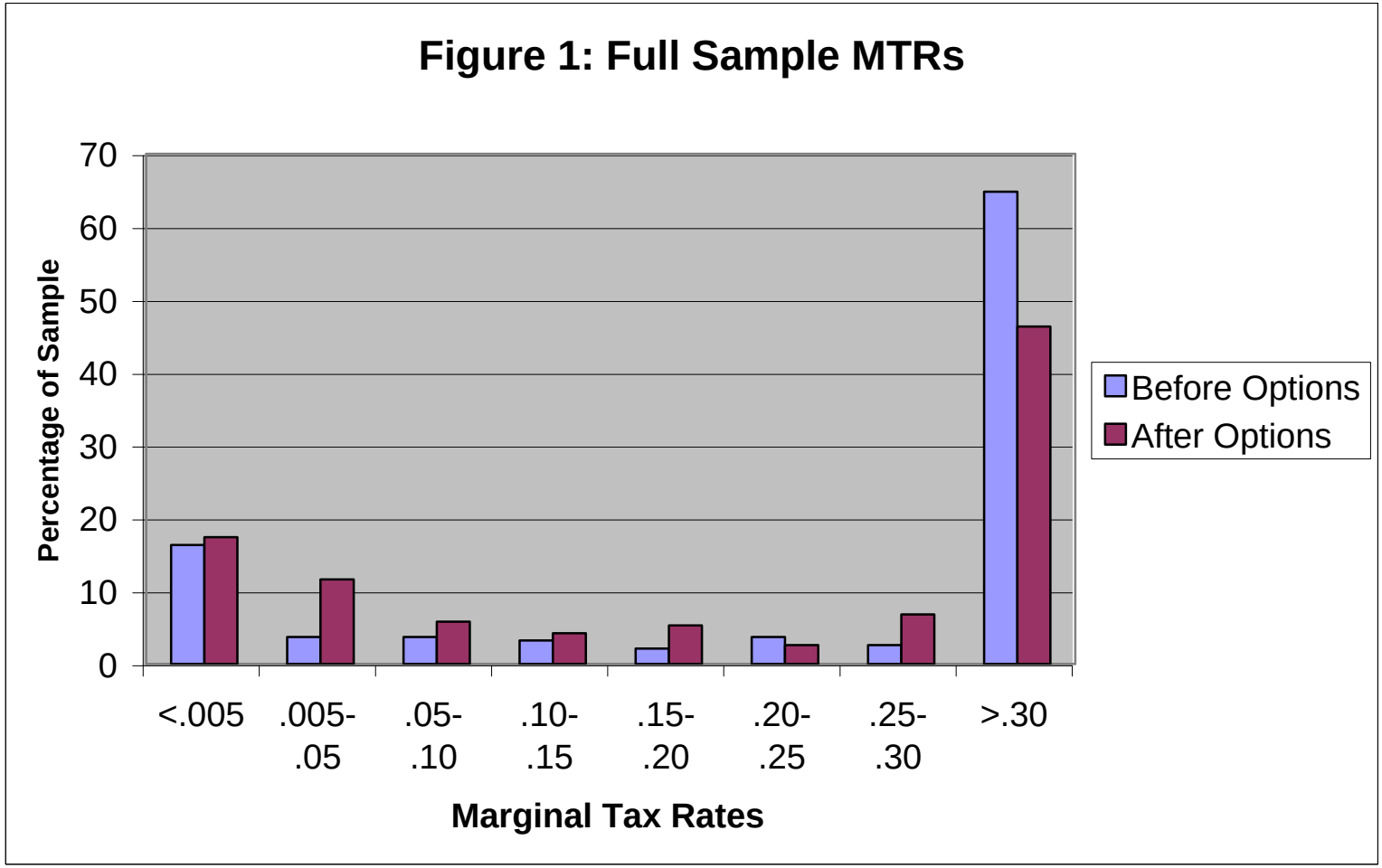
The dependent variable is *Debt-to-value* (total debt divided by book assets minus book equity plus market equity). *MTR w/o options* is a simulated marginal tax rate, assuming there are no employee stock option deductions, based on earnings before tax (EBT). *MTR w/ exercised options* is the simulated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

	1	*2*		*3*	*4*	*5*	*6*	*7*
Intercept	0.08 (0.01)	0.05 (0.01)		-0.00 (0.93)	0.01 (0.77)	0.03 (0.46)	0.04 (0.40)	0.04 (0.45)
MTR w/o options	0.07 (0.43)			0.13 (0.07)				0.22 (0.01)
MTR w/ exercised options					0.17 (0.03)			
MTR w/ current grants						0.23 (0.01)		
MTR w/ future grants		0.23 (0.01)					0.21 (0.01)	
ΔMTR w/ future grants								0.20 (0.05)
Lag PP&E / Assets				0.13 (0.01)	0.12 (0.03)	0.11 (0.05)	0.10 (0.06)	0.10 (0.06)
Lag Quick Ratio				0.01 (0.80)	0.01 (0.81)	0.00 (0.82)	0.01 (0.83)	0.01 (0.84)
Lag Cash Flow				-0.49 (0.01)	-0.50 (0.01)	-0.49 (0.01)	-0.48 (0.01)	-0.49 (0.01)
Lag R&D				-0.12 (0.04)	-0.13 (0.03)	-0.13 (0.03)	-0.13 (0.03)	-0.13 (0.03)
Lag Sales				0.01 (0.04)	0.01 (0.11)	0.01 (0.33)	0.01 (0.36)	0.01 (0.36)
n	156	156		147	147	147	147	147

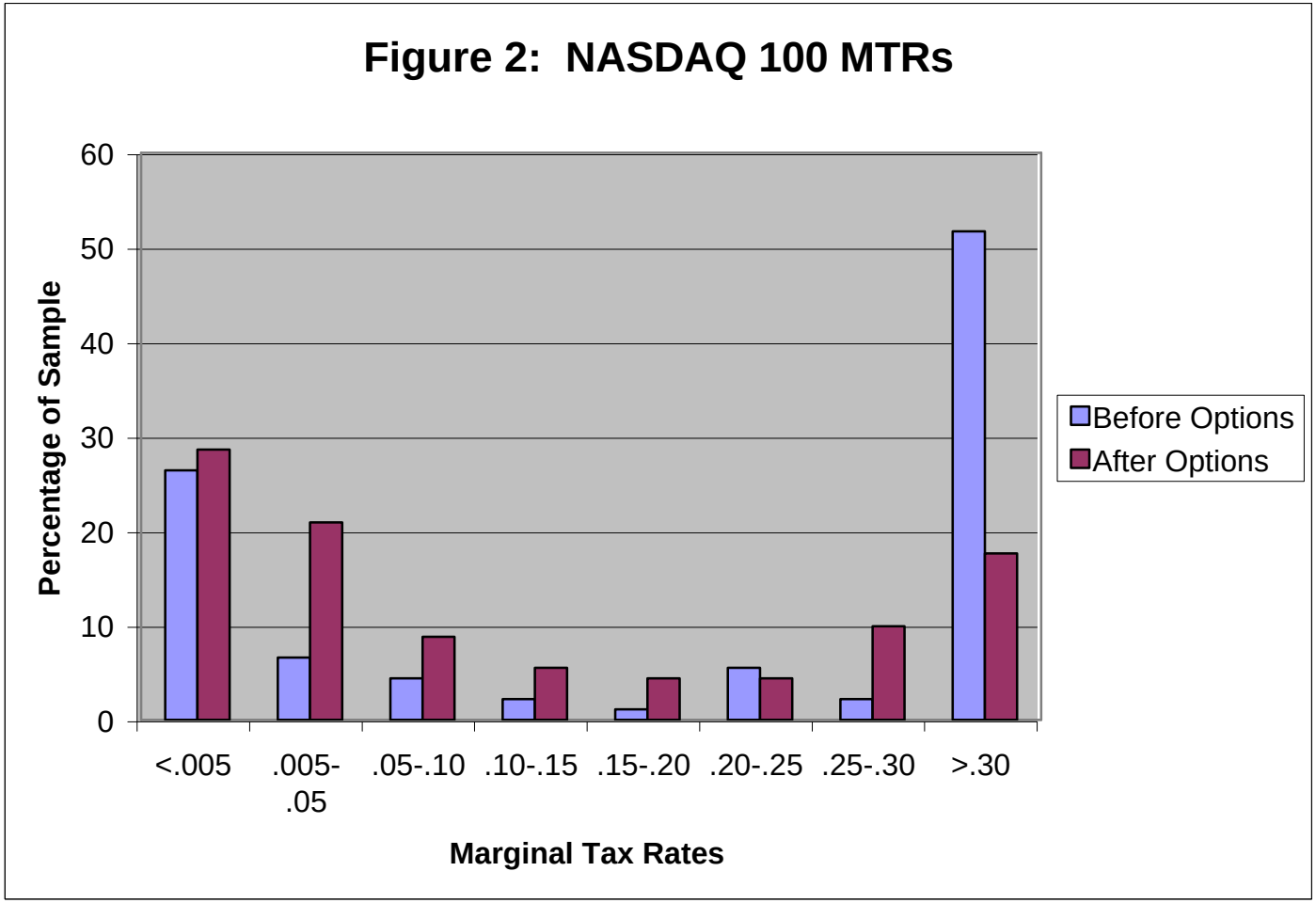
TABLE VI
More regressions of debt-to-value on marginal tax rates and control variables

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/ future grants* is the simulated marginal tax rate, with historic deductions, future deductions for already granted options, and deductions for not-yet-granted options deducted from EBT. *MTR w/ future grants (Value Line)* is the same simulated tax variable, based on stock price and growth projections from Value Line. *S&P dummy* is an indicator variable that takes on a value of one for S&P firms and 0 for Nasdaq firms. *Stock Volatility* is the volatility of stock returns. *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 rightmost 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 growth larger than the mean growth in taxable income for the sample (3.6%). The four leftmost columns include all firms with nonmissing values for the explanatory variables. The regressions are all tobit specifications, except for the "Debt>0" column, which is OLS.

	ALL FIRMS					*FIRMS WITH*				
						Debt>0	*Profits>0*	*Bond Rating*	*Invest. Grade*	*Growth>3.6%*
MTR w/ future grants		0.16 (0.05)	0.19 (0.02)	0.15 (0.07)		0.21 (0.02)	0.22 (0.01)	0.27 (0.01)	0.35 (0.02)	0.20 (0.01)
MTR w/ future grants (Value Line)	0.21 (0.01)									
S&P dummy		0.06 (0.01)								
Stock Volatility			-0.06 (0.24)							
Option Deductions / Assets				-0.09 (0.10)						
N	131	147	147	147		130	120	100	72	101



Histogram for MTRs for the 190 firms in the S&P 100 and Nasdaq 100 in 2000. *Before Options* are simulated tax rates calculated using EBT but ignoring option deductions. *After Options* are the simulated tax rates calculated using EBT, including the effect of option deductions



Histogram for MTRs for the firms in the Nasdaq 100 in 2000. *Before Options* are the simulated tax rates calculated using EBT but ignoring option deductions. *After Options* are the simulated tax rates calculated using EBT, including the effect of option deductions