

TAXING OPTIONS: DO CEOS RESPOND TO FAVORABLE TAX TREATMENT OF STOCK OPTIONS?

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INTRODUCTION

CEO stock option compensation increased tremendously from 1992-2000. In 1992, slightly more than two thirds of CEOs in the S&P 1,500 companies received some form of stock option compensation, accounting—on average—for less than a quarter of their total compensation. By 2000, over 95 percent of these CEOs were paid in stock options, accounting for close to half of their total compensation (see Table 1).¹ Table 1 shows that between 1992 and 2000, CEO stock options granted increased by 472 percent and that the mean value of stock options by 2000 was over \$4 million.

TABLE 1

Summary of the Mean and Standard Deviations of Stock Option Values, Salary, and Stock Option Share of Total Compensation from 1992 to 2000

Year	Stock Options (in \$1,000)		Salary (in \$1,000)		Stock Options as Share of Total Compensation	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
1992	707.30	1,473.59	654.22	297.28	0.244	0.236
1993	743.86	2,149.20	564.94	283.28	0.258	0.248
1994	908.63	2,214.84	536.47	288.38	0.288	0.268
1995	914.78	2,754.29	552.80	303.34	0.277	0.261
1996	1,412.82	3,754.28	575.99	308.71	0.337	0.280
1997	2,066.57	6,446.91	583.92	306.89	0.373	0.300
1998	2,210.59	6,291.34	599.54	319.00	0.406	0.300
1999	3,273.45	9,955.27	612.05	333.49	0.445	0.310
2000	4,048.44	15,379.17	654.21	356.19	0.442	0.316

If stocks obtained by exercising incentive stock options (ISOs) are held for more than one year, the income from the sale of such stock is taxed at the capital gains tax rate rather than at the ordinary income tax rate. The maximum marginal capital

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gains tax rate is much lower than the maximum marginal income tax rate during most of the 1992-2000 period covered in our data (see Table 2). This differential tax treatment creates a tax reduction opportunity for CEOs in the United States.

TABLE 2
Summary of the (Top) Marginal Income Tax Rates, Long-Term Capital Gains Tax Rates, and the Spread from 1992 to 2000

Year	Income Tax Rate (in percent)	Cap. Gains Tax Rate (in percent)	Spread b/t Income and Capital Gains (in percentage points)
1992	31.0	28	3.0
1993	39.6	28	11.6
1994	39.6	28	11.6
1995	39.6	28	11.6
1996	39.6	28	11.6
1997	39.6	20	19.6
1998	39.6	20	19.6
1999	39.6	20	19.6
2000	39.6	20	19.6

In addressing the recent scandals of Enron and WorldCom, Senator Carl Levin suggested that stock option pay encourages CEOs to push the tax benefits and accounting rules to the limit, which might have severe consequences for government tax revenues and the stability of our economy. If stock option pay lowers tax revenues and creates more uncertainty and risk, the U.S. may want to reduce the tax advantages of stock option compensation.

In addressing stock option compensation, many researchers have examined the principal-agent problem. Sanders [2001], Mehran [1995], Dhillon and Ramirez [1994], Rosen [1990], and Jensen and Meckling [1976] address whether the growing number of stock options impacts a firm's risk and performance. These studies analyze the impact of stock options and whether they improve employee relations, attract better workers, increase cash flows, reduce agency costs, promote shareholder wealth, and create takeover defense strategies to improve overall firm performance. Hall and Liebman [1998] examine the impacts of stock option compensation on firm performance. While these are all significant factors contributing to the growing importance of stock options as a form of payment, they fail to address whether federal tax policy influences CEO compensation and its consequences for the United States tax revenues.

Woodbury [1983], Rose and Wolfram [2002], Hall and Liebman [2000], Goolsbee [2000], and Auerbach and Siegel [2000] examine how tax policy alters compensation. Woodbury suggests that as income tax rates increase, so do fringe benefits or nonwage compensation in place of wage compensation. However, Rose and Wolfram find little support for the hypothesis that tax policy increases the use of nonwage stock option compensation. They examine if the tax law changes in the early 1990s (including the Omnibus act of 1993) impacts the use of nonwage performance based pay for executives and find very little evidence supporting an increase in any type of performance based pay, including stock options or bonuses.

Auerbach and Siegel [2000] examine the short-term and long-term impacts of capital gains tax rates on total capital gains compensation for the rich. Using IRS data from 1985-1994, they find that capital gains income has a short-term timing response to a change in the capital gains tax rates. Similarly, using Standard and Poor's ExecuComp database from 1991 to 1995, Goolsbee [2000] studies the responsiveness of taxable income to a change in the marginal income tax rate, *given* total compensation. More specifically, he distinguishes between the transitory (short-term) and the permanent (long-term) impacts of a change in the marginal income tax rate, when examining the shifts in compensation. Focusing on the years right before and after the 1993 increase in marginal income tax rates, he finds that the short-term elasticity of taxable income to the marginal income tax rate is greater than one due to the exercise of stock options. However, he also finds that the long-term elasticity is less than 0.4, suggesting that increases in stock option compensation are only an intertemporal shift in compensation and have very little long-term effect.

Using a data set from 1980-1994 of corporate proxies and 10k filings from CRSP, Hall and Liebman [2000] find no evidence of Goolsbee's intertemporal tax shifting once they incorporate the impacts of the stock market and the market value of the firm. Using the share of stock option compensation to total income, Hall and Liebman find that an increase in the income tax rate has a small positive impact on the share of stock options while the capital gains and the corporate tax rates have a relatively large negative impact. They also find that a 10 percent increase in the market value of a firm leads to an increase in CEO stock and stock option value by \$1.25 million. As a result, they conclude that the increase in stock options compensation was caused by the increases in the market value of the firm, instead of the changes in tax policy.

While Hall and Liebman, Auerbach and Siegel, and Goolsbee use an earlier time period to investigate the timing of compensation due to a change in tax policy, our goal is to examine whether CEOs' share of stock option compensation responds to a change in both the marginal income and capital gains tax rates throughout the 1990s. We use the ExecuComp data set from 1992-2000, which is a more comprehensive series that incorporates the tremendous increase in stock option compensation and a change in both the marginal income and capital gains tax rates.

To study the impacts of legislature governing the capital gains and income tax rates on a CEO's choice between wages and stock options, we estimate a logit model to examine whether and how preferential tax treatment affects the probability of CEOs receiving any form of stock option compensation. Then we determine the degree of this impact and examine how responsive stock option compensation is to changes in either of the two relevant tax rates using a Tobit model, using both the share of stock option compensation and the total value of stock options. In general, our findings show that both an increase in the marginal income tax rate and a decrease in the capital gains tax rate increase the probability of CEOs being paid with stock options and cause a rather large increase in the share and value of CEO stock option compensation.

The remainder of this paper provides a brief overview of federal tax policy as it relates to stock options and marginal income and capital gains tax rates in section 2.

Section 3 develops the theoretical model. The next section describes the estimation and data used in the study. Section 5 presents estimation results. Section 6 summarizes our findings, provides conclusions, and makes policy recommendations.

FEDERAL TAX POLICY

Assuming that all qualification requirements are met, the tax consequences to an employee who receives and exercises ISOs are summarized as follows.² Section 421(a) of the Internal Revenue Code of 1986 specifies that upon receipt of an ISO, the employee reports no income on his/her income tax return. If an ISO is exercised, i.e., converted into stock, no tax obligation is created. It is only once the underlying shares are sold that the tax is levied. Federal tax policy treats income from the sale of these shares (assuming that they have been held for more than one year) as capital gains that are taxed at the (lower) capital gains tax rate.

For example, assume that the Fair Market Value (FMV) of XYZ Corporation stock is \$1 on 1/1/99, and an employee is granted stock options priced at \$1. On 3/31/00 when the FMV is \$41, the employee exercises his option and later sells the stock on 5/1/01 for \$101 per share. The \$40 appreciation in value between the option price and the FMV at the date the option is exercised does not get recognized immediately, but is deferred until the time of sale of the stock. The further increase in value of \$60 is not recognized for income tax purposes until the stock is sold. Once the stock is sold, the generated income is then taxed at the lower capital gains tax rate.

Prior to 1990, this preferential tax treatment of capital gains did not exist because the maximum income tax rate on ordinary income was the same as the capital gains tax rate of 28%. Accordingly, no tax benefit could result from receiving compensation as capital vs. ordinary income, which may account for the relatively low occurrence of stock options. The Revenue Reconciliation Act of 1990 created a minor differential between the two tax rates of three percentage points. The preferential tax treatment applied to long-term capital gains became more substantial after President Clinton's 1993 Revenue Reconciliation Act, which increased the maximum marginal income tax rate to 39.6%. The Taxpayer Relief Act of 1997 created additional encouragement for stock option compensation by reducing the maximum capital gains tax rate to 20%. Since most CEOs face a marginal income tax rate of 39.6% and a capital gains tax rate of 20%, there can be a very substantial difference in the two tax rates of up to 19.6 percentage points. In summary, tax law changes during the 1990s have created a substantially different tax treatment between income from wages and income from stock options, creating both a tax deferral and a tax reduction opportunity for CEOs.

To address the impacts of these changes in tax policy on the firm, we follow Scholes et al. [2002] and hold the employee indifferent between the two types of options, while allowing the firm to determine the best compensation strategy. CEOs prefer incentive (ISOs) to non-qualified (NQO) stock options, due to the lower capital gains tax rate, a firm will only prefer ISOs if the tax saving to the CEO is greater than the taxes due by the firm, since ISOs are not a tax deduction for the firm. Scholes et al. [2002] show this as

$$(1) \quad t_{corp.} < (t_w - t_c) / (1 - t_c)$$

Thus, ISOs are preferred as long as the corporate marginal tax rate t_{corp} is less than the difference in the CEOs tax rates on ordinary income (t_w) and capital gains (t_c) divided by one minus the capital gains tax rate [see Scholes et al., 2002, 193].

MODEL

Similar to previous studies addressing the growth of nonwage benefits as a form of tax avoidance and its impacts on tax revenues, we examine if tax policy as described in Section 2 is associated with the recent increase in CEO stock options as a form of nonwage compensation. Building on Woodbury's [1983] model, we assume there are only two forms of employee compensation: 1) the quantity of wages and 2) the quantity of nonwage stock options. We also assume that CEOs have a say about their form of compensation and that they are trying to maximize their expected value of wealth.

It is important to remember that the compensation a CEO receives is the *after* tax wages and stock options. Salary or wages are taxed at the ordinary income tax rate, while stock options are taxed at the capital gains tax rate (assuming that stock options are held for over a year.) This creates an incentive for CEOs to be paid in stock options in lieu of salary considering the time value of money and that the capital gains tax rate is lower than the income tax rate.

ESTIMATION TECHNIQUE AND DATA

To empirically investigate if tax incentives have an impact on CEO stock option compensation, we regress a measure of CEO stock option compensation on the marginal income and capital gains tax rates while controlling for other factors. Specifically, we estimate

$$(2) \quad SO_i = \alpha + \beta_w(t_w) + \beta_c(t_c) + \sum_k \beta_k x_{k,i} + \varepsilon_i$$

where SO_i is a measure of stock option compensation of CEO i in a given year, t_w is the marginal income tax rate, t_c is the long-term capital gains tax rate, $x_{k,i}$ is a vector of control variables, α and the β 's are parameters to be estimated, and ε_i is an error term.

In our analysis, we estimate equation (2) three times. The first estimation is a logit model where the measure of a CEO's stock option compensation is a dichotomous variable which takes on the value "1" if a CEO received any stock options at all, zero otherwise. Once we determine if preferential tax treatment increases the probability of stock option compensation, we then want to determine if the influence of tax policy is statistically and economically significant in increasing CEO stock option compensation. We re-estimate equation (2) using a Tobit model where the dependent variable now is the share of stock option compensation relative to total compensation received by a CEO. Finally, in a third estimation, we again use a Tobit model in which the (Black-Scholes) value of stock options granted to a CEO in a given year is the dependent variable.³

Before ISOs can be exercised, they must be vested. That is, there is a waiting period between the date the stock options are granted and the date at which the stock

tied to the options can be bought. It is common that a constant fraction of the total amount vests each year. While information on the vesting period is not included in ExecuComp, we assume that the vesting period is 5 years, a commonly used value, and that the first 20 percent of the total Black-Scholes value vests in the year following the year in which the stock options were granted. The remaining 80 percent of the total value are assumed to vest in equal 20-percent increments over the following 4 years. In order to construct the dependent variable, we sum 20 percent of the reported Black-Scholes values of each of the preceding 5 years.⁴

It should also be noted that the information in ExecuComp does not permit to distinguish ISOs from NQOs (which do not have the same tax advantages for the employee as ISOs). Also, a maximum of \$100,000 worth of stock options that vest in a given year can receive the beneficial tax treatment of ISOs (see Scholes et al. for more detail.) Therefore, we use the following procedure: If the sum of 20 percent of the reported Black-Scholes values of the previous 5 years is less than \$100,000, we use that value as the dependent variable. If that sum exceeds \$100,000, we use \$100,000 as the value of the dependent variable for that observation. As justification for this procedure, we refer to a business practice that is not uncommon: Companies keep records of the amount that an individual has already received in ISOs. If a firm intends to grant more ISOs to that same individual, but that additional grant would move the total above the \$100,000 vesting maximum, the amount which is in excess of the maximum is issued in NQOs instead. As an additional measure to ensure that the included stock options indeed are ISOs (as opposed to NQOs), we use the following procedure: We exclude firms whose corporate tax rate is higher than 24.5 percent (before 1997) or 29.6 percent (from 1998-2000), respectively. The justification for that is that firms will only be willing to issue ISOs if doing so does not put them at a tax disadvantage. As can be seen in equation (1), firms prefer to pay CEOs in ISOs as long as the corporate marginal tax rate t_{corp} is less than the difference in the CEOs ordinary income tax rate minus the capital gains tax rate divided by one minus the capital gains tax rate. Assuming that CEOs hold their stock options for five years, for the period between 1993-1997 firms will prefer to pay CEOs with ISOs as long as their corporate tax rate is less than 24.5 percent. Since the capital gains tax rate fell in 1998, firms for the period of 1998-2000 prefer ISOs as long as their corporate tax rate is less than 29.6 percent. These two tax rates have been established in Scholes et al. [2002] as cutoff points below which issuing ISOs has tax benefits for both the employee and the firm.

In addition to the two tax rates in equation (2), we include several control variables at the level of the economy, the firm, and the individual that may be expected to impact the value of stock options granted to a CEO. To control for the overall increase in the stock market, we incorporate the annual average value of the NASDAQ index.

As suggested by Hall and Liebman [2000], the recent increase in stock option compensation may be due to the increase in the stock market and the increase in the current market value (MV) of the firm. Following their suggestion, we also incorporate the current market value as a control variable. However, Mehran [1995] suggests that by compensating CEOs with stock options, they are tied more closely to the firm, increasing the effort on the CEO's part, thus reducing the principal-agent

problem. The *MV* of a firm may therefore be endogenous since it may influence the amount of stock options a CEO would like to receive and stock option compensation potentially altering a firm's *MV*. Unlike Hall and Liebman [2000], we control for this potential endogeneity of a firm's market value. We obtain an instrument for a firm's current market value by regressing it on its lagged value, the annual average of the NASDAQ index, a firm's sales, return on assets, and net income, and the estimated Black-Scholes value of ISOs which a CEO receives. The fitted value from this regression is used in our main estimation.

Following Rose and Wolfram [2002] and Mehran [1995], we further control for firm performance by incorporating the firm's annual sales, return on assets, and net income (after extraordinary items and discontinued operations). Sanders [2001] suggests that while one might think that these variables are positively associated with the value of stock options granted (as a "reward" for good results), the opposite might be the case due to a tendency to grant stock options in companies which perform poorly. This might happen if stock options are used in an attempt to attract CEOs who can help turn around the company.

As additional controls at the firm level, we include one dummy variable each for small companies (smallest 10 percent in terms of number of employees) and large companies (largest 10 percent). The rationale for these two dummies is that small firms may be facing cash flow problems, creating the incentive to compensate CEOs with stock options instead of salary to help maintain a higher cash flow position. On the other hand, larger firms may have a more established history of offering stock options and economies of scale or scope when issuing stock options.

We also included a variable that takes on the value "1" if the CEO is on the company's board of directors, zero otherwise. The rationale for including this variable is that a CEO who is a board member presumably has more influence on the determination of his/her compensation package than a CEO who is not on the board. At the individual level, we include the value of a CEO's total compensation since there is some evidence that CEOs with high salaries are also the ones who receive large amounts of stock options.

We collect annual compensation data from Standard and Poor's ExecuComp database from 1992 to 2000.⁵ Thus, we can examine the changes in tax law that took place after 1992 that favor stock option compensation over salary from a tax perspective. One advantage of the ExecuComp database is its large size. It follows a total of 2,412 companies over time, which are (or were) a member of the S&P 1,500 (consisting of the S&P 500, the S&P MidCap 400, and the S&P SmallCap 600). Initially, our data set includes 93,867 individual-year observations. This number is reduced to 62,279 observations due to the exclusion of firms whose fiscal year does not end in December in order to properly account for any tax change effects. We also exclude observations for executives whose reported value of stock options granted in a certain year is missing which reduces the number of observations to 53,471.⁶ To ensure that firms would pay CEOs ISOs (as opposed to NQOs), we exclude firms whose corporate tax rate is higher than 24.5 percent (before 1997) or 29.6 percent (from 1998-2000), respectively. This restriction together with limiting the sample to CEOs leaves us with slightly more than 4,000 executive-year observations. Summary statistics for all the variables used in our estimations are presented in Table 3.

TABLE 3
Means and Standard Deviations of Variables Used in Estimations

	Mean	Standard Deviation
Dependent Variables		
Stock option indicator (0 if no stock options, 1 if any stock options)	0.92	0.27
Value of stock options (as share of total CEO compensation)	40.78	30.56
Value of stock options (\$ thousand)	88.38	29.67
Independent Variables		
Max. marginal income tax rate	39.51	0.85
Long-term capital gains tax rate	21.55	3.17
Annual NASDAQ average	2,315.07	1,008.68
Firm's sales (\$ million)	4,109.68	11,475.11
Firm's return on assets	0.63	17.54
Firm's net income (\$ million)	241.56	1,071.86
Firm's market value (\$ million)	6,992.7	22,181.20
Small firm	0.10	0.30
Large firm	0.10	0.30
CEO's total compensation (\$ thousand)	3,787.92	9,804.69

In our analysis, we assume that the marginal incomes of the CEOs in our sample are taxed at the maximum marginal income tax rate. For simplicity, we follow Auerbach and Siegel [2000], Goolsbee [2000], and Rose and Wolfram [2000] and assume that CEOs do not face the alternative minimum tax rates.⁷ We also assume that at the time of the stock option grant, CEOs know which capital gains tax rate they will face in the following year. This seems a realistic assumption to make since tax law changes are typically announced before they go into effect.⁸

RESULTS

First, we want to examine if the preferential tax treatment of capital gains vs. ordinary income alters the decision of CEOs whether to receive stock options at all. Results from the estimation of a logit model are presented in Table 4. An inspection of the estimates of the two tax rates shows that the effects of both are in the expected direction and are highly statistically significant, which is consistent with Hall and Liebman [2000]. Furthermore, the effects are rather substantial. An increase in the marginal income tax rate of one percentage point makes the average firm almost 18 percent more likely to compensate their CEO with stock options. Similarly, an increase in the capital gains tax rate by one percentage point reduces the probability that a CEO is compensated in stock options by approximately 7 percent. Collectively, these results help explain some of the tremendous increases in CEO stock option compensation. By 2000, over 95 percent of CEOs received some type of stock option compensation.

It is noteworthy that the impact of the marginal income tax rate is more than twice the respective value for the capital gains tax rate (in absolute value), which contradicts the finding in Hall and Liebman [2000] of a much stronger effect of the capital gains tax rate. One reason for this difference may be that our ExecuComp 1992-2000 data set captures the 1997 capital gains tax cut, which was not available in Hall and Liebman's earlier data set. In theory, a CEO's behavior should not be dependent on

whether there is an increase in the marginal income tax rate or a decrease in the capital gains tax rate of equal size. However, our results suggest that CEOs respond differently to such changes.

TABLE 4
Logit Regression Results for Stock Option Value
 (Reported Estimates are Odds Ratios, Standard Errors in Parentheses)

	Stock Option Indicator (0 if no stock options, 1 if any stock options)
Max. marginal income tax rate	1.17638 (0.04753)**
Long-term capital gains tax rate	0.92776 (0.02352)**
Annual NASDAQ average	1.00018 (0.00010)
Firm's sales (\$ million)	0.99998 (0.00001)*
Firm's return on assets	0.97642 (0.00637)**
Firm's net income (\$ million)	0.99987 (0.00009)
Firm's market value (\$ million)	0.99999 (0.00001)
Small firm	2.32723 (0.59892)**
Large firm	1.16246 (0.22786)
CEO's total compensation (\$ thousand)	1.00077 (0.00007)**
CEO on Board of Directors	0.91599 (0.48786)
Observations	4,267
"R-Squared"	0.16

* statistically significant at 5%

** statistically significant at 1%

Interestingly, a firm's size may also alter the probability of CEOs being compensated with stock options. Large and small firms are approximately 1.2 and 2.3 times as likely as medium-size firms (the omitted category) to compensate their CEOs with stock options. This is consistent with results found by Mehran [1995] and Jensen and Meckling [1976], suggesting that stock options may help reduce the principal-agent problem, which large firms are more likely to face. It is also consistent with results found by Sanders [2001], suggesting that stock options are used by smaller firms who are more likely to be cash constrained.

Many of the other control variables are statistically significant, but their impact on the probability that a CEO receives stock options is relatively small. For example, a \$1-million increase in sales is associated with a 0.002-percent decrease in the probability that a CEO receives any stock options at all. While this estimate is statistically significant (p-value = 0.039), we do not consider it to be "economically significant."

In our estimation, we find that, on average, the probability of receiving stock options is actually decreased for CEOs who are also on the board of directors, but the coefficient is estimated with so little precision (p -value = 0.87) that it does not seem very meaningful.

After investigating whether the marginal income tax rate and the capital gains tax rate have an impact on the probability that a CEO receives any kind of stock option compensation, we now examine how large an impact there is. As mentioned previously, we approach this issue in two alternative ways. One approach uses the value of stock options received by a CEO as a *share* of total compensation while the other uses the (Black-Scholes) *value* measured in thousands of dollars. The explanatory variables are the same as in our initial logit estimation⁹, and both estimations use a Tobit model since the dependent variables are restricted to a range of [0,100]. In the case of the share variable, the lower and upper limits are “by construction” since the variable is obtained by dividing the value of stock options by the value of total compensation (consisting of salary, bonus, and value of stock options). In the case of the Black-Scholes value of stock options, the lower and upper limits of the dependent variable are \$0 and \$100,000, respectively, since a number of CEOs do not receive any stock options and since the tax benefits apply only to the “first” \$100,000 of ISOs per vesting period.¹⁰

The results of both Tobit estimations (with robust standard errors to control for heteroskedasticity) are presented in Table 5. We find that a one-percentage point increase in the marginal income tax rate increases the share of stock option compensation by almost two percentage points. The 1993 marginal income tax rate increase from 31 percent to 39.6 percent leads to an increase in the share of CEO stock option compensation of over 16 percentage points. While Hall and Liebman [2000] suggest that the income tax rate has only a small effect on the share of stock option compensation once the market value of a firm is incorporated, our results suggest that the marginal income tax rate is a major contributor to the increase in the stock option share.

Expressed in dollar terms, we find that an increase in the marginal income tax rate of one percentage point is associated with an average increase in the Black-Scholes value of \$15,813. Both of these estimates are highly statistically significant and suggest that the effect of the 1993 income tax increase of 8.6 percentage points creates a very substantial increase in stock options for the average CEO, generating an increase in stock option pay approximately equal to \$136,000 per CEO. While Goolsbee [2000] suggests that the increase in the 1993 income tax rate caused only a transitory short-term reduction in the total taxable income and Rose and Wolfram [2002] find that tax policy has little to no effect on non-wage compensation, our results (covering the later time period from 1992 to 2000) show that an increase in marginal income taxes does cause an increase in stock option compensation.

Overall, our results show that the marginal income tax rate increase in the 1990s greatly contributed to the increase in the share of CEO stock option compensation as well as the increase in the dollar value of stock option compensation, which differs from Hall and Liebman [2000], Goolsbee [2000], and Rose and Wolfram [2002].

The impact of the capital gains tax is also highly statistically significant and of substantial magnitude: An increase of one percentage point in the capital gains tax

rate leads to an average decrease of almost one percentage point in the stock option share. This result suggests that the 1997 capital gains tax rate reduction from 28 percent to 20 percent led to a 7.7 percentage point increase in the share of stock option compensation.

TABLE 5
Tobit Regression Results for Share and Value of Stock Options
(Robust Standard Errors to Account for Heteroskedasticity in Parentheses)

	Share of stock options (percent of total compensation)	Value of stock options (\$ thousand)
Max. marginal income tax rate	1.928 (0.772)*	15.813 (5.384)**
Long-term capital gains tax rate	-0.963 (0.267)**	-4.506 (2.139)*
Annual NASDAQ average	0.002 (0.001)*	0.024 (0.007)**
Firm's sales (\$ million)	0.00001 (0.00005)	-0.0007 (0.0011)
Firm's return on assets	-0.038 (0.038)	-1.035 (0.385)**
Firm's net income (\$ million)	-0.00026 (0.00074)	-0.009 (0.008)
Firm's market value (\$ million)	0.00018 (0.00004)**	0.0002 (0.0008)
Small firm	7.617 (2.309)**	60.439 (18.008)**
Large firm	2.067 (1.736)	25.001 (17.221)
CEO's total compensation (\$ thousand)		0.054 (0.011)**
CEO on Board of Directors	6.694 (7.123)	5.048 (46.749)
Constant	-32.346 (32.260)	-389.256 (225.3901)
Observations	4,223	4,223
"R-Squared"	0.01	0.07

* statistically significant at 5%

** statistically significant at 1%

Expressed in dollar values, the average decrease in stock option compensation associated with a one-percentage point increase in the long-term capital gains tax rate is \$4,506. The capital gains tax rate reduction of 8 percentage points creates roughly a \$36,000 increase in stock option compensation per CEO. While Auerbach and Siegel [2000] find only a small adjustment in the net long-term capital gains to a change in the capital gains tax rate for wealthy individuals, our results suggest that CEOs are using tax avoidance strategies to increase their earnings as a response to the reduction in the capital gains tax rate. While our results differ from those found in Hall and Liebman [2000] and Auerbach and Siegel [2000], it should be mentioned that the forms of capital gains measured are quite different, as the data set that was used in their studies was from corporate proxies and 10k filings. Additionally, our time period captures the 1997 capital gains tax cut, which may better reflect a current CEO's response to tax policy.

As for the control variables, the NASDAQ index has the expected positive impact on the value of CEOs' stock options, but the tremendous increase in stock option pay during the 1990s is not solely explained by the strong performance of the stock market. Supporting Hall and Liebman [1998 and 2000] we find that increases in the firm's value will increase a CEO's stock option compensation. They find that the median elasticity of CEO compensation with respect to the firm's market value more than tripled from 1.2 to 3.9 between 1980 and 1994. They further suggest that CEO stock option compensation increased due to the increase in the market value of a firm as opposed to tax policy. Contrary to their results, we find that the market value of a firm has a positive, but very small impact once we control for the potential endogeneity problem.

"Sales," "return on assets," and "net income," on the other hand, are negatively related to stock option compensation (with the exception of the very imprecisely estimated effect of sales in the "share" equation). As suggested by Sanders [2001], this may have to do with the hiring of CEOs to turn a company around. Note that all six estimates are relatively small in magnitude, which is consistent with Rose and Wolfram [2002].

Our results also suggest that indeed there is a tendency in small as well as in large companies to issue more stock options to CEOs than in medium-sized firms. CEOs of small-sized firms earn an estimated 7.6 percentage points in stock option share and approximately \$60,000 more in stock option value, with p-values of less than 0.01, while CEOs of large-sized firms earn an estimated 2.1 percentage points in stock option share and approximately \$25,000 more in stock option value. Both large-size firm estimates, however, are not statistically significant at traditional significance levels. Our estimation shows that higher-paid CEOs also receive a larger amount of stock options. However, stock option compensation, on average, only increases by \$54 for an additional \$1,000 in total compensation. Finally, our two Tobit estimations suggest that being on the board of directors increases a CEO's stock option compensation, both measured as share of total compensation and in dollar terms. Both estimates are fairly large in magnitude (average increase of 6.7 percentage points and \$5,084, respectively) and seemingly contradict the result from our logit estimation where we found a negative impact of the "director" variable on the probability of stock option compensation. However, it is possible that the amount of stock option compensation conditional on receiving any stock options increases even while the probability of being compensated in stock option decreases. Moreover, all estimates of the "director" variable have rather large p-values, and our results may be explained by a low level of precision in the estimates.

In summary, all results suggest that the recent changes in tax policy have generated an increase in the share and value of stock options for CEO compensation, even after controlling for factors at the economy, firm, and individual level. The estimated effects of changes in the examined tax rates are highly statistically significant and of substantial magnitude. A comparison of the effects of the two tax rates shows that, as expected, the estimated coefficients of the two tax rates have the opposite sign. This is consistent with Woodbury [1983], who finds that higher taxed compensation will be replaced with lower taxable forms of compensation. The magnitude of the impact

of the marginal income and capital gains tax rates on the CEO share and value of stock option compensation is quite different, a result that cannot be expected based on economic theory. In the case of the “share” estimation, the magnitude of the marginal income tax rate is approximately twice as large as the impact of the capital gains tax rate. In the case of the “dollar value” estimation, the effect of the income tax rate is more than three times the size of the estimated effect of the capital gains tax rate.

CONCLUSIONS AND POLICY IMPLICATIONS

There has been a tremendous increase in CEO stock option compensation during the 1990s. During the same time period, there was an increase in the marginal income tax rates and a cut in the long-term capital gains tax rate. Results of this study suggest that current tax policy creates an increase in CEO stock option pay (both in terms of stock options as share of total compensation and in dollar terms), leading to reductions in CEOs’ tax payments. As the spread between income and capital gains tax rates increases, so will the incentive for a CEO to defer taxes and to avoid paying the higher tax rate by demanding a higher share of compensation in the form of stock options.

Our estimates show that the effect of the 1993 increase in marginal income tax rates from 31 percent to 39.6 percent generated a 16 percentage point increase in the share of stock options as well as an increase in stock option pay approximately equal to \$136,000 per CEO. Similarly, the effect of the 1997 capital gains tax cut from 28 percent to 20 percent is associated with an increase in stock option share of 7.7 percentage points and an increase in stock option pay of approximately \$36,000 per CEO.

A sense of the overall impact can be gained by the following approximation: If the sum of \$172,000 for each of the CEOs in our data set gets taxed at the long-term capital gains tax rate, which is 11.6 or 19.6 percentage points lower than the respective marginal income tax rate for the relevant range of the data, the amount of tax revenues collected will be reduced by approximately \$20,000 to \$33,700 per individual. Considering that there are approximately 2,400 CEOs in our data set to whom this calculation applies, it reduces federal tax revenues by a total amount anywhere from \$48 million to \$81 million.

There are several reasons why we believe that the true overall impact is likely to be substantially higher than our calculations suggest: First, we exclude firms whose fiscal year does not end in December, reducing the sample size by approximately one third. Second, while we only consider CEOs, in many corporations several other individuals receive stock options as part of their compensation package. Third, our data set is limited to the S&P 1,500 companies, but other firms use stock option compensation as well.

While this study does not support or discourage stock options as a form of CEO compensation, it does point out the importance of current tax policy and its incentives for CEOs to be paid in stock options to avoid tax payments. As policymakers debate future tax law changes, they should consider the effects of these changes on the mix of executive compensation and the resulting tax revenue consequences. In particular, it seems noteworthy that, according to our estimates, changes in the marginal income

tax rate lead to a response on behalf of CEOs that is of at least twice the magnitude of responses that are associated with changes in the long-term capital gains tax rate. This result was found in all three of our estimations, and the estimates are highly statistically significant. Such a finding should be taken into consideration by policymakers when changes in the tax laws and their likely consequences are being discussed.

NOTES

1. Hall and Liebman (1998) show that between 1980 and 1994 the mean value of stock option grants rose by 683 percent from \$155,000 to \$1.2 million. During this time period they also found that the sum of all CEO compensation increased by 136 percent at the median and 209 percent at the mean.
2. Section 422(b) of the Internal Revenue Code of 1986, defines an incentive stock option as “an option granted to an individual for any reason connected with his employment by a corporation, if granted by the employer corporation ... to purchase stock of ... such corporation” if several qualification requirements are met. These appear in section 422(b) and include shareholder approval, grant period and exercise period requirements, option price restrictions, transferability restrictions, and ownership requirements.
3. We establish \$0 and \$100,000 as the lower and upper limit, respectively, since the tax benefits apply only to the “first” \$100,000 of ISOs per vesting period.
4. For the years 1987-1991 (for which no Black-Scholes value is reported in the data), we assume that the annual value is the same as the 1992 value.
5. The Security and Exchange Commission (SEC) began to require public firms in 1992 to disclose grants of stock options to their top five executives as well as their option exercise activity in their proxy statements.
6. According to private communication with Standard & Poor’s, the value of stock options is missing when an executive did receive stock options in a year, but the company did not disclose sufficient information to allow for the calculation of their Black-Scholes value.
7. Since taxpayers must pay the greater of either their alternative minimum tax (AMT) or income tax liability, AMT was less of an issue during the 1990s than today, due to the 2001 and 2003 marginal income tax rate cuts.
8. Furthermore, based on the political debates leading up to major changes in tax law, CEOs may have a fairly good sense for what the eventual tax changes may be even before they must comply.
9. The estimation that has the share as dependent variable omits “CEO’s total compensation” as independent variable since the total compensation is in the denominator of the share, i.e., including total compensation in the list of independent variables would violate the assumption of exogeneity.
10. Both Tobit estimations are carried out with robust standard errors since a (Cook-Weisberg) test indicated the presence of heteroskedastic error terms. We also investigated the possibility of multicollinearity between the independent variables. Established guidelines indicate that there is no multicollinearity problem in any of our estimations.

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