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Does Tax Policy Affect Executive Compensation? Evidence from Postwar Tax Reforms

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Does Tax Policy Affect Executive Compensation?
Evidence from Postwar Tax Reforms

Carola Frydman[a]
M.I.T Sloan School of Management, United States

and

Raven S. Molloy[b]
Federal Reserve Board of Governors, United States

Abstract

The trends in executive pay and labor income tax rates since the 1940s suggest a high elasticity of taxable income with respect to tax policy. By contrast, the level and structure of executive compensation have been largely unresponsive to tax incentives since the 1980s. However, the relative tax advantage of different forms of pay was small during this period. Using a sample of top executives in large firms from 1946 to 2005, we also find a small short run response of salaries, qualified stock options, and bonuses paid after retirement to changes in tax rates on labor income—even though tax rates were significantly higher and more heterogeneous across individuals in the first several decades following WWII. We explore several potential explanations for the conflicting impressions given by the long-run and short-run correlations between taxes and pay, including changes in social norms and concerns about pay equality.

1. Introduction

An extensive literature in corporate finance and labor economics has debated potential explanations for the growth in the level of executive compensation and the increase in performance-related pay over the past three decades. Tax policy seems like a possible candidate since the rise in pay coincided with a marked drop in marginal income tax rates (see Figure 1). However, the handful of studies on this topic has found modest effects of tax policy on managerial pay, at best (Goolsbee 2000a, Hall and Liebman 2000, Rose and Wolfram 2002).[1] These results are consistent with the literature on the elasticity of taxable income, which finds limited behavioral response of top income earners —a group that includes but is not limited to corporate executives— to tax changes (Saez, Slemrod and Giertz 2010).

Using a novel dataset on top executive compensation since the 1940s, we provide new evidence on the effects of tax policy on managerial pay. Prior research on this topic has focused on the period since the 1980s, when low tax rates on labor income make the effect of taxes hard to identify. To obtain variation in tax rates, these studies compare highly-paid executives with those receiving a more modest paycheck. Thus, these estimates are based on the questionable comparability of individuals at very different points in the income distribution at a time of growing income inequality. By contrast, labor income tax rates were much higher and varied

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[1] Goolsbee (2000a) finds that the tax increase of 1993 led to a significant decrease in the taxable income of corporate executives, but that this decline could be almost entirely attributed to a change in the timing of stock option exercises rather than to a permanent change in behavior. However, Hall and Liebman (2000) find no evidence that tax reforms influenced stock option exercises in the 1980s. They also document that the tax advantage of stock options was relatively small in the 1980s and 1990s and that it had little effect on stock option grants at that time. Using a difference-in-difference approach, Rose and Wolfram (2002) find the rule limiting salaries to $1 million in 1993 had only a small effect on salaries and no effect on total compensation.

appreciably across top executives from the 1950s to the 1970s, providing a better environment to examine the effects of tax policy.

Differences in the tax-deductibility, time deferral, and tax treatment of various forms of remuneration imply that tax policy should affect the types of compensation used to remunerate executives (Scholes and Wolfson 1992, Hall and Liebman 2000, Graham 2003). We focus on the effect of labor income tax rates on three major components of the compensation package: salary plus current bonus (a bonus that is paid out in the same year that it is awarded), qualified stock option grants, and bonuses paid after retirement.[2] We also examine the sum of all forms of compensation that are taxable as labor income—which we refer to as "total taxable compensation"—because tax policy may also influence total taxable earnings relative to forms of compensation that are difficult to tax, such as perquisites and private benefits.

Time-series evidence points to a strong role for tax policy in affecting executive pay: total taxable compensation was significantly lower in the 1950s and 1960s when labor income tax rates were higher, whereas the sharp increase in pay in recent decades occurred at a time of lower tax rates (see Figure 1). On the other hand, the level of taxable compensation did not significantly change after major tax reforms, suggesting that the rise in compensation over time might be driven by other factors that led to a secular rise in the incomes of the highly-paid. Indeed, we find that the strong correlation between tax rates and the level of compensation over time is driven by long-run trends rather than by high-frequency fluctuations.

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[2] Due to difficulties of identification, our estimates of the effects of capital gains or corporate income tax rates on the compensation package are not as reliable (see Section 3). When we do take the tax rates on these two types of income into account, the estimated effects on labor income tax rates are qualitatively similar. Throughout the rest of the paper, the term "taxes rates" refers to labor income tax rates unless otherwise specified.

A limitation of the time series correlations is that they can be influenced by a large number of possible omitted variables, and therefore cannot be interpreted in a causal manner.[3] To account for omitted factors, we focus on the short-term response to tax changes and identify the effect of tax policy by comparing pre-reform to post-reform pay across executives in different tax brackets. We estimate these effects using both time-series and cross-sectional variation in changes in tax rates, using a variety of strategies to control for other factors that may confound the effect of tax changes.

For each form of compensation, we find no relationship between *changes* in tax rates and *changes* in pay. This result holds in both the entire sample and in the years from 1946 to 1972, when changes in tax rates were substantially larger and more heterogeneous across individuals. The large variation in tax rates in our sample allows us to reject statistically any meaningful short-run effect of tax rates on all of the types of remuneration that we analyze. Changes in tax rates have a small effect on compensation even when we allow these effects to occur over 3, 5 and 10-year time periods.

We also find that changes in tax rates had a negligible short-run effect on the total taxable labor income of executives, measured as the sum of salary, current bonus, long-term bonus payouts, and the value of exercised non-qualified stock options. We can reject an elasticity of taxable compensation with respect to taxes greater than 0.2, a value that is on the lower end of the broad range of estimates found in the public finance literature on this topic (Lindsey 1987,

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[3] See Saez, Slemrod and Giertz (2010) for a detailed explanation of the identification issues that difficult obtaining a reliable estimate of the long-run elasticity of taxable income.

Feldstein 1995, Goolsbee 1999, Gruber and Saez 2002, Saez 1999, Saez, Slemrod and Giertz 2010).[4]

The results based on the correlation between changes in tax rates and changes in remuneration contrast sharply with the time-series correlation between the levels of these two variables. One possible way to reconcile these two findings is if tax rates affect pay with a considerable lag. This lag would have to be fairly long, since we do not find an effect on changes in pay over periods shorter than 10 years, the longest period for which we can follow a reasonable number of executives. Social norms might play a role in creating such a long lag if the social acceptability of changing an executive's pay relative to other workers makes radical changes in pay difficult, limiting firms' ability to alter compensation packages to take advantage of tax considerations. Another way to reconcile these findings is if the long-run correlation is driven by trends in other factors. For example, a general perception that top managers have become more productive and that high tax rates suppress productivity may have led to both higher levels of pay and lower tax rates.

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[4] Lindsay (1987) and Feldstein (1995) estimate a large elasticity of taxable income (between 1 and 3) by examining changes in the distribution of taxable income around the 1981 and 1986 tax reforms. Feenberg and Poterba (1993) also find large increases in high incomes in response to the 1986 tax cuts. However, these results are potentially biased by the secular increase in income inequality in those years. Gruber and Saez (2002) use panel data on individuals in the 1980s to control for the biases imparted by inequality and mean reversion, and find that the elasticity of taxable income was about 0.6 among individuals earning more than $100,000. However, this response is largely due to changes in tax preferences such as exemptions and itemized deductions, not to changes in earned income. Using aggregate income tax return data from 1960 to 2000, Saez (2004) estimates an elasticity of wage income in the top 1 percent between 0.4 and 1. However, consistent with our results, he finds that high-income earners did not respond to Kennedy's large tax cuts in the early 1960s. Saez (1999) finds that the elasticity of adjusted gross income is 0.25 when identified from individuals near the boundary of a tax bracket 1979-1981. Finally, Goolsbee (1999) uses average incomes reported for different income groups in the *Statistics of Income* to estimate the elasticity of taxable income in reforms from the 1920s to the 1960s. His estimates for the top income group range from 0.2 to 0.7 in most reforms, but are negative for the 1935 and 1964 reforms.

The rest of the paper proceeds as follows. Section 2 presents time-series evidence on the long-run correlation between executive pay and tax rates. Section 3 describes the data and estimation strategy used to analyze changes in remuneration. Sections 4 and 5 report results for two important types of compensation: salaries and qualified stock options. Section 6 discusses the potential roles of unobserved forms of pay, and Section 7 provides estimates on the elasticity of a broad measure of income composed of all forms of compensation that are taxable as labor income. Finally, Section 8 discusses possible explanations for why the correlation between changes in tax rates and changes in pay is so small, while the time series correlation appears to be much stronger.

2. Long-Run Trends in Tax Rates and Executive Pay

As shown in Figure 1, the trends in tax rates and executive pay in the post-war period suggest that the increase in remuneration might be partly due to a decline in tax rates. To provide formal evidence for this relationship, we regress the logarithm of the level of executive pay on the logarithm of one minus the average marginal tax rate faced by top executives, a standard specification in the literature to estimate the elasticity of taxable income.[5] The measures of executive pay and tax rates are from a sample of top corporate executives that we describe in the next section. The time-series regression yields a coefficient equal to 1 (see Table 1), which is on

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[5] See Gruber and Saez (2002) and Saez, Slemrod and Giertz (2010) for detailed discussions on different methodologies to estimate the elasticity of taxable income.

the high end of available estimates of the elasticity of taxable income.[6] However, this estimate does not reflect purely the influence of tax policy due to a mechanical correlation between pay and tax rates. Specifically, the tax rate faced by an executive is a function of her tax bracket, which in turn is determined by her realized income. To eliminate this mechanical correlation, we replace the average tax rate faced by this group of executives with the maximum tax rate on labor income. The estimated coefficient is reduced substantially but it remains significantly positive and above 0.4 (see column 2), the upper end of the range of accepted estimates in the literature.

Although these simple time-series regressions estimate a strong correlation between the level of tax rates and the level of executive pay, inspection of Figure 1 shows that these two variables do not always move together, at least in the short run. For example, compensation did not increase materially in the early 1970s, even though the average tax rate fell by 25 percent (18 percentage points) during this period. Moreover, the sharp increase in executive pay in the 1990s occurred at a time of little change in the tax rates faced by top executives. To control for secular factors that may have contributed to changes in tax rates and compensation, we add a time trend to the regressions. Although it is not clear *a priori* what form the time trend should take, we find qualitatively similar results no matter whether we use a linear, quadratic, or cubic trend. In every case, the estimated correlation between taxes and pay changes sign and no longer suggests that tax cuts can explain the increase in compensation (columns 3 to 8). These results

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[6] Although earlier papers obtained estimates in the range of 1 to 3 (Feldstein 1995, Lindsey 1987), more accepted estimates from subsequent work put the long run elasticity between 0.12 and 0.4 (Saez, Slemrod and Giertz 2010).

indicate that the positive correlation between the levels of executive pay and tax rates is driven by their long-run trends rather than by high-frequency fluctuations.

One possible interpretation of the time-series evidence is that an unobserved third factor caused both the decline in tax rates and the rise in executive pay, in which case tax policy by itself had no direct impact on compensation. On the other hand, the effect of taxes may only be observed at very low frequencies if compensation practices adjust slowly over time. In this case, including a time trend (which by itself has no economic interpretation) obscures a true causal relationship. Thus, controlling for a time trend does not definitively reveal the true causal effect of tax rates on executive pay.

Another way to assess the importance of omitted variables is to examine the income of a different group of workers that are affected by similar economic forces as top corporate executives, but face different tax rates. To this end, we use the decennial Census to gather information on the salaries paid to middle managers.[7] If an unobserved factor was driving the correlation between the taxes and pay of top executives, we might expect to see a similar relationship between the taxes and pay of this group as well. The right-hand panel of Figure 2 plots the median real value of wage and salary income against the average marginal tax rate of these individuals.[8] Although there are only six data points, there is no obvious correlation between the tax rates and remuneration of this group. By contrast, there is a strong negative

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[7] Specifically, we use individuals in the occupation "managers, officials and proprietors (nec)" who report being employed in a private non-agricultural industry, who worked for wages for at least 30 hours per week, and who earned non-zero labor income. We exclude observations with top-coded wage and salary income both because this group likely includes top executives and because topcoding prevents us from determining the appropriate tax rate.
[8] We calculate an individual's marginal tax rate assuming he is married, files jointly and has no household income other than his wage and salary income. These are the same assumptions that we use for top executives (Section 3).

relationship between the pay and tax rates of top executives at these same six points in time (see the left-hand panel). Of course, the tax rates faced by middle managers did not change as much as those faced by top executives during this period, so the incentive to alter salaries was smaller. Nevertheless, the positive correlation between taxes and compensation does not seem to be generalizable to all workers in the economy, but rather seems to be specific to individuals with very high incomes.[9]

In the end, it is difficult to determine the causal effect of tax policy from time series correlations alone due to the large number of possible omitted variables. An alternative strategy is to use micro data to compare changes in compensation for executives experiencing large versus small changes in tax rates. To be able to ascribe the effects to tax policy, we calculate changes in tax rates facing these individuals that are attributable solely to tax reforms, and examine changes in various types of compensation in response to these changes in tax rates.

3. Data description and empirical strategy

3.a. Data

We use a panel dataset on the compensation of top executives in large publicly-traded firms from 1946 to 2005.[10] The sample is based on the 50 largest publicly-held corporations in 1940, 1960,

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[9] This result is consistent with a number of studies that have found the response to tax changes to be concentrated at the upper end of the income distribution (see, for example, Slemrod 1995, Saez 2004, and Saez, Slemrod and Gietz 2010).
[10] The majority of the sample (about 75 percent) is composed of manufacturing firms. See Frydman and Saks (2010) for a detailed description of the data collection, sample selection, and variable definitions.

and 1990 (a total of 101 firms). [11] The data from 1946 to 1991 were hand-collected from proxy

statements, and from 1992 to 2005 they were obtained from Compustat's Executive

Compensation database (ExecuComp). Firm-level information is from CRSP and Compustat,

with some variables in the early parts of our sample collected from various editions of *Moody's

Industrial Manual*, *Moody's Transportation Manual*, and *Moody's Public Utility Manual*.

Table 2 reports basic descriptive statistics of the entire dataset, which includes the five

highest-paid officers in each firm in a given year.[12] There are nearly 3,000 individual executives

and each one is observed for an average of 6 years, giving a total of 15,000 executive-year

observations (col. 1). Since these data are representative of the compensation of top executives

in the 300 largest publicly traded firms in a given year (Frydman and Saks 2010), our results on

the effect of tax policy should be interpreted accordingly.[13]

The dataset includes four different types of labor income that we can measure

consistently over time: salaries plus current bonuses (bonuses awarded and paid out in the same

year), the Black-Scholes value of stock option grants, the value of exercised stock options, and

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[11] Our analysis includes the executives in every firm for as many years as we can follow, regardless of the firm's
size in that year. Thus, a concern is that the smaller firms in our sample are not representative because they are
either going to become successful or are formerly successful firms in decline. However, the results are robust to
including only observations where the firm is ranked among the 50 largest firms in that year.

[12] Frydman and Saks (2010) used only the 3 highest-paid executives in each firm because many corporations did not
disclose information on lower-paid executives prior to World War II. Since our focus is on the postwar period, we
are able to include the 4th and 5th highest-paid executives. Including these executives improves the power of our
estimates, but all of the results are qualitatively similar when we restrict the sample to the top 3 managers.

[13] Our results do not necessarily extend to small firms or private companies. For example, Cadman, Klasa and
Matsunaga (2010) show that the determinants of executive pay are different for ExecuComp and non-ExecuComp
firms.

long-term incentive pay (bonuses that are received for several years after they are awarded).[14]

We also present evidence on bonuses paid after retirement, for which we have data through

1991. Finally, we provide estimates of the elasticity of taxable income by studying the

responsiveness of all taxable forms of compensation to changes in tax policy.

3.b. Estimation strategy and identification issues

Since many issues about identification are pertinent for all forms of pay, we follow a similar

estimation strategy to evaluate the effect of tax policy on each type of remuneration.

Specifically, we regress the change in each separate type of remuneration on the change in the

logarithm of one minus the marginal tax rate on labor income, which we refer to as the "net-of-

tax rate":[15]

$$\Delta \ln(remun_{it}) = \beta \Delta \ln(1 - \tau_{it}) + \Gamma X_{it} + \varepsilon_{it} \qquad (1)$$

where the vector X_{it} includes individual and firm characteristics (to be described below).

Theory predicts that changes in taxes should affect the *share* of compensation awarded in

various forms, as firms substitute tax-advantaged for tax-disadvantaged forms of pay. Our

specifications use the level of pay because we do not observe all of the components of total pay

required to calculate the denominator (like pensions and perks), but results are similar when

using each form of compensation as a fraction of total pay as the dependent variable. Thus, our

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[14] Although it would be useful to separate salaries from current bonus payments, many firms reported only the sum of the two prior to 1992.
[15] For every type of compensation except salaries, a considerable number of observations take a value of zero. Therefore, we examine the first difference of these forms of pay instead of the change in the logarithm. The distributions of these first differences are very heteroskedastic, so we trim the top and bottom 1 percent in each year.

specification is similar in spirit to estimates of the elasticity of taxable income, in which untaxed forms of income are unobserved.

In addition to labor income tax rates, taxes on capital gains and corporate income also alter the tax incentives for different components of the compensation package (Scholes and Wolfson 1992, Hall and Liebman 2000). Thus, a thorough analysis of how tax policy affects compensation decisions should have a broad perspective that takes into account the implications of all types of taxes for both the employer and the employee. However, assessing the effects of capital gains and corporate income tax rates in our data is difficult. These rates changed infrequently during our sample period and, when they did change, these changes usually occurred at the same time, making identification of their separate effects based on time series problematic (see Figure 2). Several factors also limit our ability to identify the effects of these rates by exploiting cross-sectional differences in taxes. First, there is no cross-sectional variation in the marginal capital gains tax rate, as all executives faced the same rate. In addition, there is little cross-sectional variation in the corporate income tax rate in the firms in our sample. Prior papers have estimated cross-sectional differences in corporate tax rates from cases in which firms have negative earnings or can take advantage of tax-loss carryforwards (Hall and Liebman 2000, Plesko 2003). However, these outcomes are rare in our sample of large firms. For example, more than 95 percent of the firms in our sample report pre-tax income more than 10 times the cutoff for the maximum corporate income tax rate.[16]

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[16] Using a more sophisticated approach, Graham (1996, 2007) uses dynamic information on both net operating loss carrybacks and carryforwards to calculate firms' tax rates from 1980 to 2005. His data confirm the lack of cross-sectional variation in corporate income tax rates in our sample: For the firms in our sample that we can match to

Given these limitations, for most types of compensation we focus on labor income tax rates. The analysis of qualified stock options is an important exception; due to the difference in the tax deductibility of qualified options compared to cash, controlling for all tax rates is essential.[17] Nevertheless, in general we do not find important effects of changes in capital gains or corporate income tax rates, nor does including these rates alter the estimated effect on labor income tax rates.

By focusing on the changes in pay and taxes rather than on the levels of these variables, estimating equation (1) mitigates many person-specific omitted factors that would bias our estimates. Still, due to the progressive structure of tax policy, the change in the tax rate faced by an executive will reflect other changes in his or her income beyond those induced by changes in tax policy. In particular, if individuals endogenously alter their behavior in response to the marginal tax rate of each tax bracket, the observed change in tax rates will not reveal the exogenous effect of the change in policy. To solve this problem, we calculate the change in tax rates in year *t* as the rate an individual would have faced had his or her income been the same as it was in the previous year (Gruber and Saez 2002).

We calculate an executive's marginal income tax rate assuming that his income is equal to the total annual compensation that is taxable as personal labor income (defined as salary+current bonus+payouts from long-term incentive programs+the value of exercised non-

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Graham's estimates, 84 percent of Graham's estimates are within 1 percentage point of the maximum corporate rate. It is possible that these estimates overestimate the actual tax rate faced by the firm because of stock option deductions, but Graham, Lang and Shackelford (2004) show that this effect is small for S&P 100 firms.

[17] For example, Core and Guay (2001) find that high tax-rate firms are less likely to use option compensation for non-executive employees, possibly to take advantage of the immediate deduction of cash compensation.

qualified stock options) and that he files jointly with a spouse. Unobserved sources of household income and tax deductions make this estimate an imperfect approximation of the actual marginal rate faced by an individual. However, microdata from the Statistics of Income (which are available from 1960 onward) suggest that the measurement error in our estimate of tax rates is relatively small.[18]

Table 3 shows the distribution of changes in the net-of-tax rate on labor income in every year of our sample in which tax rates changed. In the first half of the sample, a number of tax reforms led to significant changes in the net-of-tax rate. For example, large positive values of the change in the net-of-tax rate in 1964 and 1965 illustrate the tax cuts associated with the 1964 Tax Reform. In spite of being among the highest-paid individuals in the economy, the tax system was so progressive that the executives in our sample were in different tax brackets. Thus, there is considerable variation in tax rates across individuals during most of these reforms, which allows us to precisely estimate the effect of changes in tax rates. By contrast, all executives were in the top income bracket after 1971, and the changes in tax rates after that year were much smaller. Therefore, the earlier part of our sample is a more natural environment to look for an effect of tax policy on executive pay.

We estimate equation (1) pooling the data from all years in a single regression and controlling for each executive's initial taxable compensation. Thus, we identify the effect of tax

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[18] Specifically, we match the executives in our sample in 1960, 1970, 1980, 1990, and 2000 to individuals in the SOI data who report a similar amount of *wage* income. For 1980 to 2000 we compute an "SOI tax rate" as the average reported marginal income tax rate in the SOI data among individuals with similar wage income. For 1960 and 1970 (when marginal tax rates are not reported) the SOI tax rate is the marginal income tax rate implied by the level of *total taxable income* reported in the corresponding SOI data. In each year, the correlation of our estimated tax rate based on executive compensation and the SOI tax rate is greater than 0.98.

rates by comparing two executives with similar levels of compensation but at two different points in time—one prior to one reform and the other prior to a different reform—such that they faced different changes in tax rates due to the different reforms. This strategy controls for mean reversion in income, which causes higher-income executives to experience larger reductions in labor income, thereby leading to a systematic relationship between the predicted change in tax rates and the change in pay even if there is no true effect of tax policy (Gruber and Saez 2002).[19]

Estimating a single regression over the entire sample period is also appealing because it generates more variation in changes in tax rates than can be obtained from any single reform. However, results based on comparisons over time might be misleading if omitted factors that evolve over time, such as income inequality or corporate governance, are correlated with both tax policy and changes in compensation. Therefore, we also estimate specifications that include year fixed effects on a sample ending with the 1969 reform (which enacted a series of changes in marginal income tax rates through 1972), since there is no cross-sectional variation in changes in tax rates after that time. We find similar results using either specification.[20]

In all specifications, we control for a number of other variables that might be correlated with both changes in tax rates and changes in executive pay: the executive's job title in the previous year and whether this title changed in the current year, whether the executive sat on the

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[19] Gruber and Saez (2002) account for mean reversion by controlling for a nonparametric function of income in addition to ln(income). Our results are similar when we control for lagged compensation in a similar manner, but we report specifications with only ln(income) for simplicity.

[20] A third estimation strategy would be to estimate the regression for each separate tax reform. However, it is difficult to control for mean reversion in such a specification because changes in tax rates are determined by initial income. Moreover, we cannot implement this strategy for post-1971 data because tax rates do not vary across the executives in our sample after 1971.

board of directors in the previous year and whether their director status changed in the current year, the firm's sales in the previous year (to proxy for firm size), the firm's market value in the previous year (another measure of firm size), the rate of return on the firm's stock price in the previous year (to capture past firm growth), the firm's leverage in the previous year (defined as the ratio of liabilities to assets), and the firm's market-to-book ratio in the previous year (to proxy for growth opportunities). An extensive literature in accounting and corporate finance shows that these variables have an effect on the level and structure of executive pay (see, for example, Smith and Watts 1992, Bizjak, Brickley and Coles 1993, Core, Holthausen, and Larcker 1999, Murphy 1999, Core, Guay, and Larcker 2008, Graham, Li and Qiu 2009).

Despite its advantages, an important drawback of estimating the effect of tax rates from annual fluctuations in tax rates and pay is that this methodology only captures the immediate effect of tax rates on compensation. In some specifications we examine changes over 3-, 5- or 10-year periods to allow the effect of taxes to occur slowly over time, but this strategy still cannot address the possibility that it takes longer than 10 years for these effects to surface. We will return to this issue in Section 8 when we discuss the interpretation of our results.

4. The Effect of Taxes on Salary and Bonus

We start by examining the relationship between tax rates and the logarithm of salaries plus current bonuses (which we will refer to as "salaries"). We would expect the coefficient on the net-of-tax rate to be positive, since a decline in tax rates (and therefore an increase in the net-of-tax rate) should make salaries a more attractive form of remuneration. As shown in column 1 of

Table 4, there is no meaningful relationship between changes in taxes and salaries when we look at the simple correlation of these two variables with minimal controls; the coefficient on the net-of-tax rate is small, and we can reject an elasticity greater than 0.2 with 95 percent confidence.[21] Controlling for mean reversion in compensation (column 2) does not alter this result.

A potential source of bias in these estimates is that the secular trend in income inequality might be correlated with changes in tax rates over time (Slemrod 1996).[22] We address this issue by including a cubic time trend to account for smooth changes in income inequality during our sample period. We also interact this trend with lagged income to allow the effect of inequality on changes in salaries to vary with the level of income. Including these controls has no material effect on the estimated coefficient on the net-of-tax rate (column 3). Results are similar if we control for inequality by including the share of aggregate wages and salaries earned by the 95th to 99th percentile of the income distribution (computed by Piketty and Saez 2003) and growth in real GDP (Goolsbee 2000b) (results not shown).

Another concern is that firms may differ along dimensions that might be correlated with both changes in tax rates and changes in pay. As discussed above, a large literature in finance and accounting shows that a host of industry and firm characteristics are important correlates of the level and structure of executive pay. Although we control for as many firm-specific factors as possible, many other firm characteristics, such as corporate governance, are more difficult to

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[21] In all specifications, we cluster the standard errors by year because clustering along other dimensions yields much smaller standard errors. Thus, clustering by year makes it the most difficult to reject a large elasticity. Results are similar when we use a two-way clustering method to cluster by both year and executive.

[22] Slemrod (1996) shows that an apparent effect of taxes on the income of the rich during the Revenue Act of 1986 disappears when directly controlling for a measure of income inequality.

measure. In column 4, we control for unobserved differences across firms by including decade-specific firm fixed effects; we still find little effect of taxes in this specification.[23]

Because the attractiveness of various forms of remuneration depends on corporate income and capital gains tax rates in addition to personal income tax rates, in column 5 we control for changes in the net-of-tax rates on all three types of income. Including these other tax rates does not materially change the coefficient on the net-of-tax rate on labor income. In addition, the coefficient on the net-of-tax rate on corporate income has an unexpected sign, since a decrease in corporate income taxes (increase in the net-of-tax rate) should make payment of salaries less advantageous to the firm relative to other forms of pay that are not deductible. However, the coefficients on the corporate and capital gains tax rates should be interpreted with caution because they are identified only from changes in these rates over time, which occurred infrequently.

Finally, we control for omitted factors that might be correlated with changes in tax policy over time by including year fixed effects in the regression. The sample period is limited to 1947-1972 because we do not have cross-sectional variation in tax rates after that period. Another advantage of examining this period separately is that income inequality did not change dramatically at that time (Piketty and Saez 2003), so any bias from a correlation between inequality and tax rates should be small. As shown by columns 6 to 8, neither changing the

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[23] Controlling only for firm fixed effects would be insufficient to capture unobservable factors because firms may have changed substantially during the 60-year sample period. Therefore, we allow the firm fixed effects to vary by decade. We do not present results that allow the firm fixed effects to vary by year because we have at most 5 executives per firm in each year. Nevertheless, the effect of tax rates is unchanged in such a specification.

sample period nor including year fixed effects leads us to find that changes in salaries were related to changes in income tax rates.

In summary, using micro-data we find no evidence that the effect of tax policy on annual changes in salaries and current bonuses was sizable. However, we would not expect annual changes in pay to reflect changes in tax rates immediately if salaries adjust slowly over time. To investigate this possibility, we examine changes in salaries over 3-year, 5-year and 10-year periods. Table 5 reports results over these longer horizons based on the specifications in columns 3 and 4 of Table 4 (our preferred specifications because they include rough controls for income inequality and/or omitted firm characteristics). Although there is a small positive correlation between 3-year changes in tax rates and 3-year changes in salaries when decade-specific firm fixed effects are included (column 2), this result is not robust across specifications (column 1). Moreover, the coefficient estimates become negative when we examine changes in pay over longer periods of time (columns 3 to 6).[24] Thus, salaries and bonuses do not appear to respond to changes in tax rates, even after a period of up to five or ten years.

5. The Effect of Taxes on the Use of Qualified Stock Options

Since the early 1990s, employee stock options have become a major component of an executive's compensation package (Murphy 1999). The vast majority of these options have been non-qualified, meaning that they are taxed as labor income and firms can claim them as a

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[24] We also estimate an elasticity close to zero for the other specifications shown in Table 4 (not shown).

corporate deduction (like cash compensation).[25] Taking into account the tax implications for

both the firm and the executive, Hall and Liebman (2000) show that non-qualified stock options

have had only a minor tax advantage relative to cash compensation, which is primarily due to the

deferral of the tax payment.[26] The dashed line in Figure 4 uses their formula to show the tax

advantage of non-qualified options relative to cash for the average executive in our sample. The

tax advantage of these options relative to cash has been relatively small, reaching a maximum of

only about 6¢ per $1 of compensation in the late 1980s and early 1990s. Thus, it is not

surprising that tax policy appears to have had at most a minor role on the rapid growth of non-

qualified stock options since the 1980s (Goolsbee 1999, Hall and Liebman 2000, Katuscak

2005).

In contrast to the options that are prevalent today, the majority of employee stock options

granted in the 1950s and 1960s were "qualified." Stock options were rarely used to compensate

top executives prior to the 1950s, in part due to uncertainty about their tax implications for firms

and executives (Washington and Rothschild 1962).   This uncertainty was resolved by the 1950

Revenue Act, which introduced qualified (also called "restricted" or "incentive") stock options.

Executives receiving qualified options were untaxed on both the grant and the exercise date,

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[25] For most of our sample period, non-qualified stock options were not taxed upon grant. Instead, the gains from exercising non-qualified options were taxed as personal income at the time of exercise, while future appreciation on the shares purchased with these options were taxed as capital gains. The corporation received a tax deduction upon exercise for the amount of the exercised gains.

[26] As described by Hall and Liebman (2000), cash and stock options receive different rates of return over the period in which option payouts are deferred. While executives can invest option payouts at a pre-personal-tax rate of return, cash compensation would yield a lower after-tax rate. Moreover, the advantage of deferring taxes is higher when the corporate tax rate is low.

while the appreciation on shares acquired with these options was taxed as capital gains. However, firms received no corporate tax deduction on qualified stock options.

Was the tax advantage of qualified options large enough to alter the compensation packages of corporate executives in a meaningful way? As with any form of compensation, determining its advantage relative to other forms of pay requires taking into account the tax implications for both the firm and the executive. Given the large differences between the marginal tax rates on labor income and capital gains at that time (see Figure 3), this type of remuneration was advantageous from the executive's perspective. However, from the firm's perspective qualified options were disadvantageous relative to cash compensation because they could not be deducted from corporate income.

The solid line in Figure 4 depicts the average advantage of qualified stock options relative to cash compensation over our sample period using the method of Hall and Liebman (2000), which takes into account the tax implications for both the firm and the executive. From 1950 to 1963, qualified options had an advantage of about 14¢ for each $1 of compensation for the average executive in our sample, more than twice the peak of the tax advantage of non-qualified stock options relative to cash compensation. Firms began introducing qualified stock option plans in the early 1950s, and the use of this type of option became relatively common over the following 20 years (Frydman and Saks 2010).

Subsequent tax reforms in the 1960s and 1970s reduced the tax advantage of options by lowering labor income tax rates, increasing capital gains tax rates, and imposing more stringent requirements on the attributes of qualified options. In fact, qualified stock options became

disadvantageous relative to cash compensation from a pure tax perspective in 1971. Firms

began to substitute qualified option plans for non-qualified ones around this time (Hite and Long

1982), again suggesting a response of compensation practices to tax policy. The granting of

qualified stock options was banned from 1976 to 1981 and has been subject to a stringent cap

since then. Since then, the vast majority of options granted have been non-qualified.[27]

    While both the adoption of qualified stock option plans in the 1950s and their replacement

with non-qualified option plans in the early 1970s are suggestive of the importance of tax

considerations, the timing alone does not prove a causal effect of tax policy. Rigorous analysis

of the 1950 reform is not feasible due to the lack of option use prior to the reform.[28] Instead, we

focus our analysis on the period between 1950 to 1975, when the tax advantage of qualified

options was notable and varied considerably across executives due to differences in labor income

tax rates. In addition, several tax reforms during this period introduced large changes in this

advantage across executives. Using variation in changes in tax rates across executives is

appealing because it controls for unobservable differences across individuals as well as factors

that might have been correlated with the evolution of tax rates and option grants over time.

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[27] The rapid growth in non-qualified options since the 1990s could be related to their advantageous tax deductibility
because the tax code imposed a cap of $1 million for corporate deductions of non-performance-based executive pay
in 1993. However, research has found only a modest effect of the cap on the structure and level of executive pay
(Rose and Wolfram 2002, Hall and Liebman 2000, Perry and Zenner 2001).
[28] The standard "difference-in-difference" estimation strategy is not feasible because almost no executive received a
grant prior to the reform. Thus, the pre-reform period cannot be used to control for differences across executives in
the probability of receiving a grant. Still, we find no evidence that executives facing higher tax rates received more
options during the five years after the 1950 reform. However, since tax rates are determined by an individual's
income level, they are likely correlated with many other unobservable factors (such as productivity) that also affect
the use of stock options.

We test for an effect of tax rates on stock option grants by estimating changes in the Black-Scholes value of qualified options granted to each executive as a function of changes in her net-of-tax rates on labor income, corporate income, and capital gains. We use this specification to allow different tax rates to affect stock options in a flexible way, but results are similar when we include the tax advantage as formulated by Hall and Liebman (2000) or a simplified version of this advantage.[29] We would expect changes in stock option grants to be positively correlated with the net-of-tax rates on corporate income and capital gains, but negatively correlated with the net-of-tax rate on labor income. We include all of the same controls as in the salary and bonus specification.

As shown in column 1 of Table 6, there is no statistically significant effect of changes in any of the tax rates on the value of qualified stock option grants for the 1951 to 1975 period. Moreover, the signs of the coefficients are not in the expected directions. As we discussed in Section 3, the effects on capital gains and corporate income tax rates should be interpreted with caution because these rates changed in only a few occasions over our sample period and they do not vary across firms or individuals. As an alternative, we include year fixed-effects to control for any year-specific omitted factors that might be correlated with changes in labor income tax rates and qualified stock option grants (column 2). The coefficient on the labor income tax rate is unchanged, and we can reject with 95 percent confidence that a 1-standard deviation increase in the net-of-tax rate would reduce the value of qualified stock option grants by more than

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[29] Ignoring the benefits from investing the different forms of pay over the period of deferral of option payouts, the tax advantage of qualified stock options relative to cash compensation to the firm can be measured by $(1-\tau_c)(1-\tau_{cg})-(1-\tau_p)$, where τ_c is the tax rate on corporate income, τ_{cg} is the rate on capital gains, and τ_p is the personal income tax rate. We find no significant effects of tax rates using this specification.

$7,500 (equivalent to less than 1/20 of a standard deviation of the changes in the value of stock option grants in this sample).

Because employee stock options were generally granted only once every few years to each executive during this sample period, using annual changes in option awards may underestimate the effect of changes in tax policy. To address this problem, we estimate the same specification for the average value of options granted over a three-year period (columns 3 and 4).[30] We do not find statistically significant effects of any net-of-tax rate on this smoothed measure of option grants, and the signs are still frequently opposite from the expected direction.

In sum, we find little evidence of a short-run effect of changes in tax rates on option grants, even during a period when qualified stock options had a sizable tax advantage over other forms of pay. However, this strategy may underestimate the effect of tax policy if it takes more than several years for remuneration to respond to changes in tax advantages. Because the timing of the proliferation of qualified stock option plans and substitution of non-qualified for qualified options coincides strongly with the rise and fall of the tax advantage of qualified options, it is difficult to conclude that the use of qualified options was not at least partly attributable to tax considerations. Nevertheless, the unresponsiveness of option grants to changes in their tax advantage suggests that other factors may have been more salient determinants of option use.

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[30] Specifically, the dependent variable is the 3-year change in the average value of qualified options granted in the past 3 years. The sample size shrinks significantly because it is limited to executives who remain in the sample for a longer period of time and because the sample does not begin until 1955 (the first year for which the 3-year change in the 3-year average of option grants includes only years in which qualified options were allowed). The sample for the fixed-effects specification ends in 1974 (instead of 1972 as in col. 2) because the 3-year change in tax rates varies across individuals in 1973 and 1974.

6. Other Forms of Pay: Retirement Benefits and Perks

Several types of compensation that we do not observe are not taxed as labor income when they are awarded. It is possible that these other forms of pay responded to changes in tax rates, even though observed forms of pay did not. Thus, our analysis may underestimate the effect of taxes by only including some components of pay. Two main unobserved forms of pay that we are particularly concerned about are retirement benefits and perquisites.

For a given tax rate on corporate income, pensions are tax-advantaged at times of high personal income tax rates since executives are not taxed until retirement, when they usually drop down to a lower income tax bracket. In fact, experts on executive compensation in the 1950s and 1960s frequently mentioned high taxes as a reason for the expansion of executive pension plans (NICB 1953, Patton 1961, Smyth 1960). We do not have enough information to analyze the pensions of the executives in our sample.[31] However, prior research suggests that the value of pensions as a fraction of total executive pay was not much lower in recent years than it was in the 1960s, even though labor income tax rates were much higher at that time.[32]

A type of post-retirement compensation that we do observe in our data is the award of bonuses to be paid after retirement as part of plans designed specifically for top executives. The fraction of executives receiving these bonuses rose from near zero in the 1940s to 25 percent in

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[31] Proxy statements present descriptions of retirement plans, but an assessment of their value for each individual would require information that we lack, such as the executive's age, tenure, and salary prior to retirement.

[32] Lewellen (1968) reports that retirement benefits were 15 percent of after-tax total pay from 1950 to 1963. Because pensions were taxed at a lower rate than labor income, their value relative to total pre-tax pay must have been even lower than 15 percent. By contrast, Sundaram and Yermack (2006) find increases in the actuarial value of pensions to be about 10 percent of CEO pay from 1996 to 2002, and Bebchuk and Jackson (2005) report that the ratio of executives' retirement benefits to total pay received during the CEO's entire career was 34 percent in 2004.

the 1960s and then fell back to 12 percent from the mid-1970s to 1990 (ExecuComp did not

record these bonuses so we cannot observe them post-1991). To assess the correlation of these

bonuses with tax rates, we regress the change in the dollar value of the retirement bonuses

awarded to each executive as a function of the change in their net-of-tax rate. We expect the

coefficient on the net-of-tax rate to be negative, since a decrease in taxes on labor income

(increase in the net-of-tax rate) should reduce the tax advantage of retirement pay. There is no

relationship between these two variables in the full sample (column 1 of Table 7) or when the

sample is limited to 1947-1972, the years when the historical record suggests that tax policy

spurred deferred pay (column 2). We find a small effect when we include year fixed effects

(column 3), but the estimated coefficient has the wrong sign: executives facing larger tax cuts

get larger increases in retirement bonuses.[33] We also find no effect if we examine changes in the

3-year average value of retirement bonus awards, which reduces volatility of bonus awards and

allows taxes to have a delayed effect (results not shown).

Perquisites and other private benefits are other likely candidates for remunerating

executives when tax rates are high. Even though the Internal Revenue Code of 1954 included

fringe benefits as taxable income, the IRS was unable to enforce taxes on perquisites because of

a lack of information about these benefits (McGahran 1988).[34] The SEC's disclosure

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[33] We also find no correlation of changes in tax rates with changes in the logarithm of retirement bonus awards, indicating that the magnitude of these awards does not depend on tax rates.

[34] Information from court cases against executives in the 1950s suggests that perquisites were not large enough to account for the low level of observed compensation mid-century. For example, penalties for high business expenses—i.e. amounts that executives were forced to return to the corporation because they were found to be excessive—were in the range of $20,000 to $40,000 (Washington and Rothschild (1962), less than half of observed remuneration in our sample.

requirements changed in 1978 to include perks over a minimum threshold, but data on perks

remained problematic because they were lumped with many other forms of remuneration and

firms often claimed to be below the minimum threshold of disclosure. Although information on

perks improved after 1992, its accuracy was still questionable and prompted a further

improvement in disclosure requirements in 2006.[35]

Due to these data limitations, the only way to gauge the value of perks awarded to the

executives in our sample is to look at "other compensation," a measure that lumps perquisites

with other forms of pay, and for which we have values from 1978-1981 and 1993-2005. The

median value of this category relative to total taxable compensation was about 3 percent in the

earlier period (when the top marginal tax rate was 50 percent) and less than 1 percent in the later

years (when the top marginal tax rate was between 35 and 40 percent). These statistics are

consistent with the idea that perks were used more when labor income tax rates were higher,

although the evidence is inconclusive because more forms of pay were included in the "other

compensation" category in the earlier period. In any case, the difference between the two

periods in the magnitude of "other compensation" is much smaller than the difference in tax

rates.

In summary, it is difficult to assess whether the introduction of pensions or perks earlier

in the century was spurred by the high tax rates at that time. However, the available evidence

suggests that these forms of pay were unrelated to tax policy in subsequent years: these benefits

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[35] Most research has focused on whether a certain perk was offered rather than on its actual value (Rajan and Wulf 2006, Yermack 2006). Moreover, average disclosed perquisites increased by 190% following an improvement in the SEC's disclosure rules in December 2006, suggesting that the level of perks was severely underestimated in earlier years (Grinstein, Weinman and Yehuda 2009).

did not materially decrease as their tax advantages diminished, and differences across individuals were not correlated with tax rates. It is possible that firms did not optimally tailor these forms of compensation to take advantage of the tax system because their tax implications were difficult to fully comprehend and benefit plans tended to change only infrequently (Patton 1961).

7. The Effect of Taxes on Total Taxable Compensation

Finally, we combine different forms of remuneration to examine the effect of tax policy on an executive's total taxable compensation. This analysis is similar in spirit to the literature on the elasticity of taxable income (Slemrod 2000). We define compensation that is taxable as labor income as the sum of salary, current bonus, long-term bonus payouts, and the value of exercised non-qualified stock options.[36] Although an executive's remuneration is not the only form of income she receives in a year, our measure of taxable compensation is highly correlated with taxable income reported in the SOI data.[37]

Table 7 reports the results of regressing the change in the logarithm of taxable compensation on the change in the logarithm in the net-of-tax rate. As in the case of salaries, we expect the coefficient on the net-of-tax rate on labor income to be positive because a decrease in tax rates (and therefore an increase in the net-of-tax rate) should make taxable forms of remuneration more attractive. We use the same specifications as in Section 3 to control for mean

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[36] Since long-term bonuses are taxed as labor income and can be deducted as an expense from the firm's income, their only tax advantage relative to cash is that the tax payment is deferred. The payout-period of these bonuses is usually around four years, so the advantage of this deferral is relatively small. Consequently, we do not analyze the correlation of tax rates with long-term bonuses separately. In unreported results, we find no correlation between long-term bonuses and tax rates.

[37] Matching the individuals in our sample in 1960, 1970, 1980, 1990, and 2000 with individuals with similar wages in the SOI microdata, the correlation of our estimate of taxable compensation with taxable income in the SOI data is greater than 0.94 in every year.

reversion, income inequality, and observable and unobservable firm characteristics. Results are very similar to the estimated effect on salary and bonus alone—in every specification we can confidently reject an elasticity of taxable compensation with respect to the net-of-tax rate greater than 0.2. These results are consistent with the negligible effect of tax rates found by Goolsbee (1999) for tax reforms prior to 1986, using both the income share of high earners (based on aggregate data from tax records) and executive compensation micro-data during the 1971-72 and 1935 tax reforms.

Although the estimated coefficients on tax rates in Table 7 are small, they are still a bit larger than the estimated effects on salary+bonus alone. Thus, it appears that the other forms of remuneration that are taxed as labor income—gains from exercising non-qualified options and long-term incentive bonus awards—are somewhat more sensitive to changes in tax rates than salaries. Indeed, other researchers have found that tax reforms have sometimes altered the timing of when executives receive bonuses and exercise stock options (Goolsbee 2000a, US Bureau of Economic Analysis 1993). In a specification similar to Gooslbee (2000a), we also find that changes in the value of option exercises are positively related to the change in the net-of-tax rate on labor income in the current year and negatively related to the change in the net-of-tax rate on labor income in the subsequent year. Consistent with Hall and Liebman (2000), this result is entirely driven by the 1992 tax reform. We find no evidence of such effects on the timing of stock option exercises in the periods from 1975 to 1990 or from 1995 to 2005.

8. Reconciling the Time Series Evidence with the Short-Run Correlation of Compensation and Tax Rates

In summary, we have found little evidence that *changes* in tax rates are related to *changes* in executive pay, even though the correlation between the *levels* of these two variables over a long period of time seems large. Three possible interpretations of these findings are that (a) we have no accurately identified the short-run effect of taxes on pay, which is actually substantial, (b) we have not accurately identified the long-run effect of taxes on pay, which is actually small, or (c) both of these results are valid and there is a reason why the short-run elasticity is much smaller than the long-run elasticity. We address each of these possibilities in turn.

The lack of correlation between annual changes in compensation and tax rates is remarkably robust across a number of different types of remuneration and a variety of specifications. Moreover, these estimates are precise enough to rule out any economically meaningful effect. Nevertheless, it is possible that unobserved factors may be masking the true effect of taxes on pay. One such possibility is that some tax reforms were intended by legislators to be temporary. Firms may choose not to respond to transitory changes in taxes if the cost of altering the compensation package for a brief period is sufficiently high. Using the narrative analysis of postwar tax changes of Romer and Romer (2008), we repeat our estimation for each type of pay assuming that no change in taxes occurred in tax reforms that they identify as temporary. However, we find no correlation of the permanent changes in tax rates with any component of executive pay (Panel A of Table 8).

A similar concern is that some tax reforms are endogenous to changes in national income and the state of the economy, which might bias the estimated effect of tax rates on executive pay. Therefore, we repeat our estimation for each type of pay assuming that no change in taxes occurred in tax reforms that Romer and Romer (2008) identify as endogenous. Even in this case, the correlation of the exogenous changes in tax rates with any component of executive pay is negligible (Panel B of Table 8).

A third reason why executive pay may be unresponsive to changes in tax rates is that compensation might be primarily determined by the provision of managerial incentives as in a standard principal-agent model, leaving little scope to alter pay for other reasons. We assess this explanation by controlling for the correlation between wealth and firm performance, measured by the executive's dollar gain in stock and stock option wealth from a 1 percent increase in market value (following Core and Guay 1999) or from a dollar increase in market value (as in Jensen and Murphy 1990). Changes in each form of pay are not appreciably related to either measure of the sensitivity of wealth to performance, and these controls do not alter our estimates for the changes in labor income tax rates (Panels C and D of Table 9). Thus, incentive provision does not seem to explain our findings.

Turning to the large estimated elasticity from the long-run evolution of taxes and executive pay, it is certainly possible that an omitted factor has caused both the level of compensation to increase and tax rates to fall over time. The absence of a correlation between the tax rates and salaries of middle managers suggests that such an omitted factor would be specific to individuals at the very top of the income distribution. One such plausible force might

be social norms. Social tolerance of income inequality seems to have diminished during this period (Piketty and Saez 2003, Levy and Temin 2008), which might have led to an increase in top incomes and a decrease in top tax rates. Another factor that might have shaped the trends in executive pay and tax rates is a general social perception about productivity and incentives. A belief that top executives have become more productive, whether accurate or not, may have increased firms' willingness to pay a higher premium for their CEO. At the same time, the idea that high tax rates reduce productivity and labor supply might have bolstered support for lower tax rates. For example, Alesina and Angeletos (2005) show that a belief that an individual's effort determines her income would lead to low taxes and low redistribution, while the opposite would be true in societies that attribute wealth to luck or connections.

In practice, these hypotheses are difficult to test because social perceptions are hard to measure and are likely correlated with many other secular trends in the economy. One shred of evidence supporting the idea that the perceived return to having a talented CEO may have increased is that the pay differential between the highest-paid and other executives in the same firm expanded considerably from the 1980s to the 2000s, while pay differentials between the other four top executives were relatively unchanged. However, the difference between the highest-paid and other executives might reflect a change in the market for CEOs or a true increase in the relative productivity of the highest-paid (Murphy and Zábojník 2004, Gabaix and Landier 2008), rather than a change in perceptions about their marginal product that may have affected both tax rates and the compensation they could extract from firms.

Finally, is it possible that the long-run elasticity can be large even though the short-run elasticity is small? One mechanism that could reconcile these two effects is if compensation arrangements change only very slowly over time. For example, top executives may have a long-term contract with their firm that determines their pay for at least several years in the future. More generally, if executive pay is determined through a complex bargaining process that involves, among other considerations, the social acceptability of high pay, it may take a long period of time for the effect of taxes to fully affect compensation. Thus, social norms could also deter the responsiveness of remuneration to tax incentives by making radical changes in pay more difficult.

One potential weakness of this hypothesis is that we found little responsiveness of salaries to changes in tax rates for up to ten years after a tax reform. However, we observe only relatively few individuals over such a long period of time, and the type of executive with a long tenure in our sample might not be representative of the larger group. Furthermore, if social norms are responsible for delaying the response of incomes to tax rates, then it might take more than ten years for these effects to take place.

Another possible way to reconcile these two sets of results is if pay was unresponsive to tax rates in the first half of our sample, but became more sensitive to tax rates over time. Our short-run results are identified mainly from the 1946-1972 period because tax rates only vary across individuals in this portion of the sample. By contrast, the long-run estimates are mainly driven by the increase in compensation and decrease in tax rates since 1980—the time-series coefficient estimate is 0.18 for the period 1946 to 1979, and 2.3 for 1980 to 2005. One factor

that might have changed markedly during our sample period is a concern about equality within the firm, which may have limited firms' ability to differentiate executives' compensation packages during the 1950s and 1960s. Arch Patton—one of the best-known management consultants of the post-World War II era (*New York Times* Nov. 30 1996)—stated that in the 1960s and 1970s "the compensation of upper-echelon positions moves in lockstep, like soldiers in a parade" (Patton 1994).

If concerns about equality abated over time, firms would have had more scope to align individuals' compensation packages with their tax advantages. Although equality concerns, and social norms more generally, are difficult to measure, several other researchers have found evidence consistent with a decrease in social preference for income equality (Piketty and Saez 2003, Levy and Temin 2008). Thus, one interpretation of our results is that the estimated correlation between pay and tax rates captures a combined effect of social norms and taxes: social pressure prevented firms from aligning pay with tax rates mid-century, but as these norms changed compensation packages became more flexible to adapt to tax advantages.

9. Conclusion

Using a novel dataset on top executive compensation in the entire post-war era, we find little response of executive salaries, bonuses (both short-term and long-term), and stock option grants to changes in labor income tax rates. In contrast to previous studies of executive pay that focus on the period since the 1980s, the historical data provide much larger variation in tax rate changes both across individuals and over time with which to identify the effect of tax policy.

Because our results are precisely estimated, we can rule out any meaningful response of the forms of executive pay that we observe to changes in tax rates in the short or medium run (within five to ten years).

Our results do not imply that tax policy has not affected any aspect of executive pay. For example, high tax rates in the 1950s and 1960s might have spurred the adoption of qualified stock options even though the use of options did not decrease as their tax advantage diminished over time. Tax policy also appears to influence the choice between qualified and non-qualified stock options (Hite and Long 1982, Madeo and Omer 1994, Austin, Gaver and Gaver 1998), CEOs' willingness to sell their equity in the firm (Jin and Kothari 2009), the timing of when executives receive bonuses and exercise stock options (Goolsbee 2000a, Hall and Liebman 2000), and the backdating of option exercises (Dhaliwal, Erickson and Heitzman 2008). In addition, the tax incentives of different forms of pay can affect other aspects of corporate financial policies. For example, firms that can deduct large amounts of compensation from corporate income have a smaller incentive to use debt as a tax shield (DeAngelo and Masulis 1980). On the other hand, the economic magnitude of the effect of tax policy on corporate financial decisions tends to be small (Graham 2003).

The small short-run response of remuneration to tax rates that we documented stands in sharp contrast to the strong correlation between the long-run trends of these variables. These divergent results suggest that the long-run trends in tax rates and pay are driven by slow-moving aspects of the economic and social environment, possibly intangible factors such as social tolerance of income inequality or managerial productivity (both actual and perceived). Although

hard evidence on such unobservable influences is difficult to find, our results suggest that they

might be important in explaining the joint evolution of tax rates and executive compensation in

the past fifty years. Thus, an important challenge for future research is to disentangle the pure

tax effect from the effects of other factors that are related to the long-run evolution of tax rates.

Moreover, our results imply that policy makers should use caution if attempting to use tax policy

to regulate the pay of corporate executives and other high-income earners, because other factors

such as social norms or bargaining processes that determine pay may limit the ability of taxes to

affect compensation practices, at least in the short run.

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Table 1
Correlation of Tax Rates and Executive Compensation
(dependent variable= Median Ln(Real Taxable Compensation))

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(1-average tax rate)	1.00**		-0.32*		-0.20**		-0.08	
	(0.11)		(0.18)		(0.06)		(0.08)	
Ln(1-top tax rate)		0.41**		-0.28**		-0.09**		-0.04
		(0.60)		(0.07)		(0.03)		(0.03)
Time trend	No	No	Linear	Linear	Quadratic	Quadratic	Cubic	Cubic
# Obs.	60	60	60	60	60	60	60	60

Note. Standard errors are reported in parentheses. * and ** indicate significance at the 5 and 10 percent levels, respectively. Regression is estimated from 1946 to 2005. Real taxable compensation is (salary+bonus+long-term incentive pay+exercised non-qualified stock options) deflated by the CPI. Median compensation is calculated from a sample of the 5 highest-paid executives in the 50 largest firms in 1940, 1960, and 1990 (a total of 101 firms). Average tax rate is the average marginal tax rate faced by the executives in the sample. Top tax rate is the highest marginal tax rate on labor income in the tax schedule. See Section 3 for details on the sample, measurement of compensation, and calculation of tax rates.

Table 2
Summary Statistics

	Entire Sample (1946-2005)	1946-1972
Observations	15,429	6,457
Executives	2,924	1217
Mean firms per year	53	40
Mean executives per firm per year	4.1	4.1
Mean observations per executive	6.3	6.3
Mean salary+bonus ($2000)	$990,645	$755,293
Mean value of stock options granted ($2000)	$508,568	$66,582
Mean value of long-term bonus pay	$315,047	$79,584
Mean value of retirement bonuses[+]	$72,482	$67,577
Mean firm market value (billions of $2000)	16.5	11.4
Median firm market value (billions of $2000)	6.0	4.0
Mean firm rank by sales	103	64
Median firm rank by sales	59	43

+ This average is for 1946-1991 only because we do not observe these grants after 1991.
Note. Sample based on the 5 highest-paid executives in the 50 largest firms in 1940, 1960, and 1990 (a total of 101 firms). Salary and bonus measured as the level of salaries and bonuses (paid out in either stock or cash) awarded and disbursed in the year. The value of stock options granted is measured using the Black-Scholes formula. Market value measured from CRSP at the end of the fiscal year. Firm rank is the ranking by sales of all firms traded on the NYSE, S&P, NASDAQ or ASE.

Table 3
Distribution of the Change in Ln(1-Marginal Labor Income Tax Rate)

| | Percentiles | | | | | Standard |
	10th	25th	50th	75th	90th	Deviation
1948	0.381	0.458	0.562	0.708	0.789	0.144
1950	-0.125	-0.078	-0.054	-0.044	-0.038	0.030
1951	-0.464	-0.277	-0.239	-0.183	-0.146	0.118
1952	-0.115	-0.150	-0.095	-0.077	-0.061	0.027
1954	0.083	0.089	0.096	0.113	0.141	0.027
1964	0.147	0.230	0.307	0.443	0.759	0.215
1965	0.074	0.092	0.134	0.189	0.244	0.062
1968	-0.192	-0.183	-0.143	-0.119	-0.109	0.034
1969	-0.073	-0.073	-0.053	-0.048	-0.039	0.014
1970	0.124	0.136	0.166	0.206	0.206	0.036
1971	0.035	0.093	0.212	0.312	0.348	0.118
1972	0.174	0.223	0.223	0.223	0.223	0.036
1987	0.207	0.207	0.207	0.207	0.207	0.006
1988	0.055	0.055	0.055	0.055	0.055	0.004
1991	0.060	0.060	0.060	0.060	0.060	0.004
1993	-0.133	-0.133	-0.133	-0.133	-0.133	0.011
2001	0.008	0.008	0.008	0.008	0.008	0.000
2002	0.008	0.008	0.008	0.008	0.008	0.006
2003	0.057	0.057	0.057	0.057	0.057	0.002

Note. Based on the marginal tax rates of the 5 highest-paid executives in the 50 largest firms in 1940, 1960, and 1990 (a total of 101 firms). There is no change in marginal income tax rates in all other years. The 1982 reduction of the top marginal income tax rate from 70 to 50 percent does not appear in this table because the marginal tax rate on *labor* income had already been reduced to 50 percent by 1972.

Table 4
Annual Changes in Ln(Real Salary+Bonus)

	1947-2005					1947-1972		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ Ln(Net-of-tax rate on labor income)	0.003	-0.001	0.017	0.024	-0.034	0.033	0.031	-0.089
	(0.033)	(0.027)	(0.031)	(0.031)	(0.036)	(0.035)	(0.019)	(0.074)
Ln(Initial real income)	--	-0.082**	-0.120**	-0.354**	-0.121**	--	-0.119**	-0.122**
		(0.009)	(0.039)	(0.058)	(0.036)		(0.016)	(0.016)
Δ Ln(Net-of-tax rate on corporate income)	--	--	--	--	0.338**	--	--	--
					(0.152)			
Δ Ln(Net-of-tax rate on capital gains)	--	--	--	--	0.025	--	--	--
					(0.117)			
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cubic time trend	No	No	Yes	No	Yes	No	No	No
Initial real income*cubic time trend	No	No	Yes	No	Yes	No	No	No
Initial real income*decade FE	No	No	No	Yes	No	No	No	No
Firm*decade FE	No	No	No	Yes	No	No	No	No
Year FE	No	No	No	No	No	No	No	Yes
# Obs.	15429	15327	15327	15327	15327	6457	6457	6457
Adj. R^2	0.03	0.06	0.08	0.14	0.08	0.04	0.12	0.14

Note. Standard errors are clustered by year. All regressions control for the executive's job title in the previous year, director status in the previous year, indicators for whether job title or director status changed from the previous to the current year, and the firms' market value, sales, leverage and market-to-book ratio in the previous year. Real income is the executive's taxable income (salary+bonus+long-term incentive pay+exercised non-qualified stock options) deflated by the CPI. The change in the net-of-tax rate on labor income is calculated assuming that an individual's remuneration remains constant and that tax rates change only due to tax reforms. The corporate income tax rate is the top marginal rate. * and ** indicate significance at the 10 percent and 5 percent levels, respectively.

Table 5
Longer-Run Changes in Ln(Real Salary+Bonus)

	3-year change		5-year change		10-year change	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Ln(Net-of-tax rate on labor income)	0.042	0.078**	0.001	0.028	0.014	0.056
	(0.036)	(0.028)	(0.051)	(0.040)	(0.046)	(0.037)
Cubic time trend	Yes	No	Yes	No	Yes	No
Firm*decade FE	No	Yes	No	Yes	No	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	11361	11361	8094	8094	3084	3084

Note. Standard errors are clustered by year. All regressions control for the executive's real income, job title and director status in the initial year, indicators for whether job title or director status changed from the initial year to the current year, and the firms' market value, sales, leverage and market-to-book ratio in the initial year. The change in the net-of-tax rate on labor income is calculated assuming that an individual's remuneration remains constant and that tax rates change only due to tax reforms. * and ** indicate significance at the 10 percent and 5 percent levels, respectively.

Table 6
Changes in Qualified Option Grants in the 1950s and 1960s

	Real Value of Grants$_t$ – Real Value of Grants$_{t-1}$		Average Real Value of Grants$_{t-2 \text{ to } t}$ – Average Real Value of Grants$_{t-5 \text{ to } t-3}$	
	(1)	(2)	(3)	(4)
Δ Ln(Net-of-tax rate on labor income)	0.011	0.043	-0.040	0.011
	(0.055)	(0.044)	(0.045)	(0.037)
Δ Ln(Net-of-tax rate on corporate income)	-0.175	--	0.198	--
	(0.202)		(0.150)	
Δ Ln(Net-of-tax rate on capital gains)	-0.963	--	-0.077	--
	(0.838)		(0.188)	
Other controls	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes
Sample period	1951-75	1951-72	1955-75	1955-74
# Observations	6137	5261	2324	2222

Note. Standard errors are clustered by year. Real income is the executive's taxable income (salary+bonus+long-term incentive pay+exercised non-qualified stock options) deflated by the CPI. All regressions control for the executive's initial job title and director status, indicators for whether job title or director status changed from the initial year to the current year, and the firms' market value, sales, leverage and market-to-book ratio in the initial year. Initial values are t-1 for columns 1-2 and t-3 for columns 3-4. The change in the net-of-tax rate is from t-1 to t in columns 1-2 and from t-3 to t in columns 3-4. The change in the net-of-tax rate on labor income is calculated assuming that an individual's remuneration remains constant and that tax rates change only due to tax reforms. * and ** indicate significance at the 10 percent and 5 percent levels, respectively.

Table 7
Correlation of Retirement Bonus Grants with Income Tax Rates

	Real Value of Grants$_t$ – Real Value of Grants$_{t-1}$		
	(1)	(2)	(3)
Δ Ln(Net-of-tax rate)	0.029	0.031	0.012
	(0.021)	(0.021)	(0.011)
Other controls	Yes	Yes	Yes
Year Fixed Effects	No	No	Yes
Sample period	1947-91	1947-72	1947-72
# Observations	10841	5285	5285

Note. Standard errors are clustered by year. Real income is the executive's taxable income (salary+bonus+long-term incentive pay+exercised non-qualified stock options) deflated by the CPI. All regressions control for the executive's initial job title and director status, indicators for whether job title or director status changed from the initial year to the current year, and the firms' market value, sales, leverage and market-to-book ratio in the initial year. Initial values are the previous year and the change in the net-of-tax rate is from t-1 to t. The change in the net-of-tax rate on labor income is calculated assuming that an individual's remuneration remains constant and that tax rates change only due to tax reforms. * and ** indicate significance at the 10 percent and 5 percent levels, respectively.

Table 8
Changes in Ln(Real Taxable Compensation)

|	1-year change		3-year change		5-year change		10-year change	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Change in ln(1-mtr)	0.037	0.039	0.047	0.094**	-0.018	-0.011	-0.079*	-0.046
	(0.032)	(0.043)	(0.041)	(0.037)	(0.062)	(0.067)	(0.045)	(0.068)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cubic time trend	Yes	No	Yes	No	Yes	No	Yes	No
Firm*decade FE	No	Yes	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.17	0.26	0.21	0.39	0.26	0.49	0.43	0.65
# Obs.	15316	15316	11351	11351	8088	8088	3081	3081

Note. Standard errors are clustered by year. All regressions control for the executive's job title and director status in the initial year, indicators for whether job title or director status changed from the initial to the current year, and the firm's market value, sales, leverage and market-to-book ratio in the initial year. Real taxable compensation is (salary+bonus+long-term incentive pay+exercised non-qualified stock options) deflated by the CPI. The change in the net-of-tax rate on labor income is calculated assuming that an individual's remuneration remains constant and that tax rates change only due to tax reforms. * and ** indicate significance at the 10 percent and 5 percent levels, respectively.

Table 9
Testing Explanations for the Lack of a Short-Run Correlation Between Taxes and Executive Pay

|	Δ Ln(Salary + Bonus) (1947-1972)	Δ Stock Option Grants (1951-1972)	Δ Retirement Bonus Grants (1947-1972)	Δ Ln(Taxable Compensation) (1947-1972)
	(1)	(2)	(3)	(4)
Panel A: Excluding Temporary Tax Reforms				
ΔLn(Net-of-tax rate)	-0.082	0.058	0.012	-0.041
	(0.086)	(0.063)	(0.014)	(0.093)
Panel B: Excluding Endogenous Tax Reforms				
ΔLn(Net-of-tax rate)	-0.100	-0.001	0.010	-0.043
	(0.106)	(0.021)	(0.017)	(0.111)
Panel C: Including Pay-to-Performance (Jensen-Murphy statistic)				
ΔLn(Net-of-tax rate)	-0.109	0.017	0.024**	-0.083
	(0.070)	(0.021)	(0.012)	(0.078)
Pay-to-performance	-0.002	-0.001	-0.000	-0.002
	(0.003)	(0.002)	(0.000)	(0.003)
Panel D: Including Pay-to-Performance (Equity-at-Stake)				
ΔLn(Net-of-tax rate)	-0.109	0.017	0.024**	-0.083
	(0.070)	(0.021)	(0.012)	(0.078)
Pay-to-performance	-0.002	-0.001	-0.000	-0.001
	(0.003)	(0.002)	(0.000)	(0.003)

Note. Standard errors are clustered by year. Column (2) uses changes in annual compensation for period 1951-1972. All other columns use data from 1947 to 1972. Each panel shows a separate regression with the dependent variable named in the column heading. All regressions include year fixed effects and control for the executive's initial job title and director status, indicators for whether job title or director status changed from the previous year to the current year, and the firm's market value, sales, leverage and market-to-book ratio in the previous year. Temporary (1950, 1951, and 1968) and endogenous (the temporary reforms plus the reform in 1969) reforms are identified according to Romer and Romer (2008). The Jensen-Murphy statistic is measured as the dollar increase in the previous year's stock and stock option holdings for a $1000 change in the firm's market value. Equity-at-stake is measured as the dollar increase in the previous year's stock and stock option holdings for a 1 percentage point increase in the firm's rate of return (Core and Guay 1999). The change in the net-of-tax rate on labor income is calculated assuming that an individual's remuneration remains constant and that tax rates change only due to tax reforms. * and ** indicate significance at the 10 percent and 5 percent levels, respectively.

Figure 1
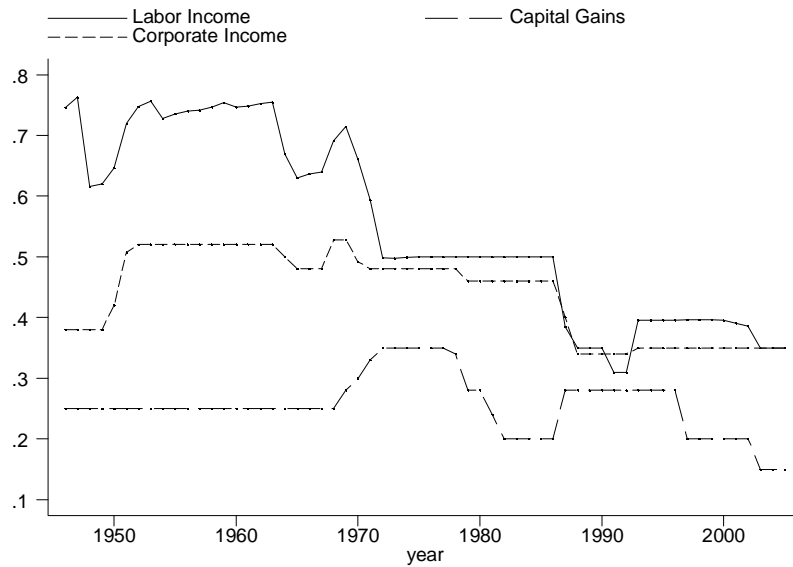## Taxable Compensation and Labor Income Tax Rates
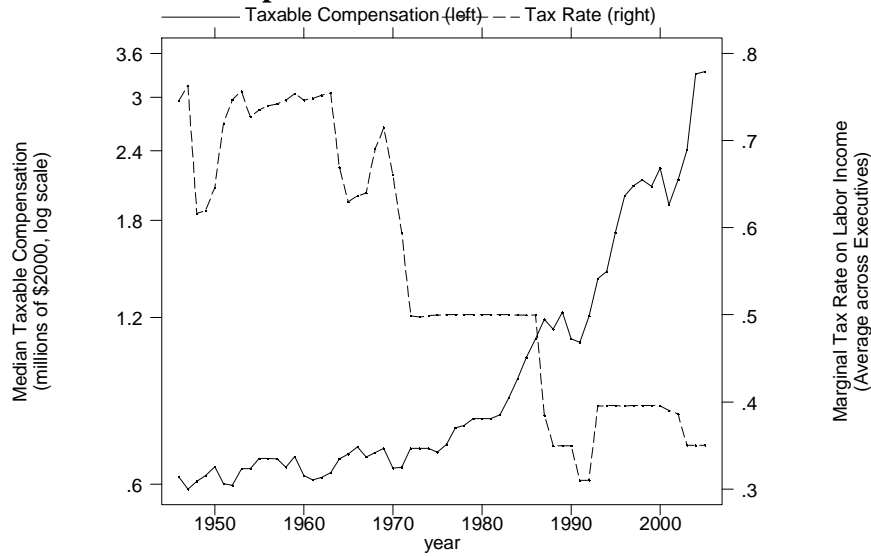
Note. Based on a sample of the 5 highest-paid executives in the 50 largest firms in 1940, 1960, and 1990 (a total of 101 firms). Taxable compensation is the sum of salary, current bonus, long-term incentive payouts, and gains from exercised non-qualified stock options. Marginal tax rates on labor income for each executive are calculated assuming that his reported labor income is equal to his taxable compensation and that he files jointly with a spouse.

Figure 2
## Correlation of Remuneration with Tax Rates Over Time
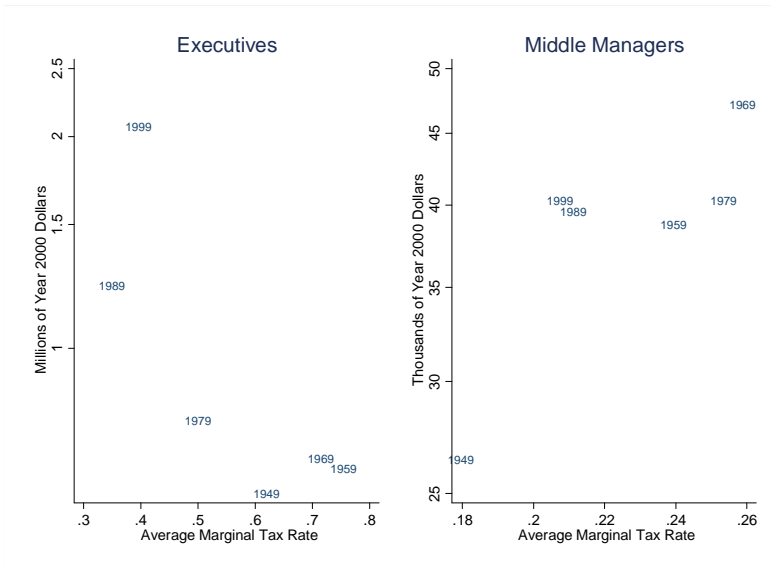
Note. Executive tax rates and compensation are as described in the notes to Figure 1. Tax rates and compensation for middle managers are individuals in the "manager, nec" occupation in the decennial Census. See Section 2 for details.

Figure 3
Tax Rates

Note. The labor income tax rate is the marginal rate on labor income averaged across the executives in our sample. The rate for each executive is calculated assuming that his reported labor income is equal to his taxable compensation and that he files jointly with a spouse. The corporate income tax rate is the top marginal rate.

Figure 4
Tax Advantage of Stock Options Relative to Cash
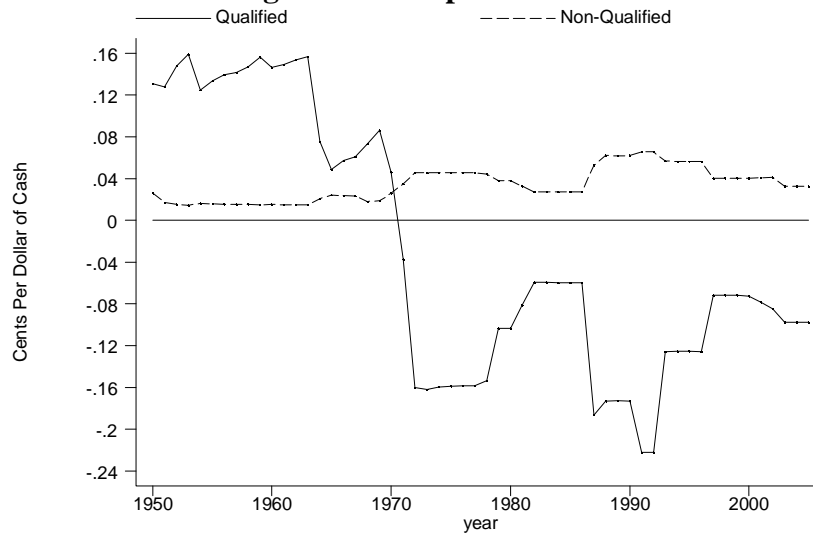
Note. Each line shows the average across executives. The tax advantages are calculated following Hall and Liebman (2000).