HOW EXECUTIVE COMPENSATION CHANGES IN RESPONSE TO PERSONAL INCOME TAX SHOCKS (WHO PAYS THE CEO'S INCOME TAXES?)

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We quantify the effects of personal income taxes on executive compensation in the US. After a state income tax rate increase, CEO pay increases within two years by an amount three-quarters or more of the way to fully compensating the CEO for the increased tax liability. When the net-of-tax rate changes by 1% due to a state personal income tax shock, CEO pay changes by approximately 0.730% to 0.906%. These estimates indicate that the demand curve for managerial input is as much as 10 times as inelastic as the supply curve, with the credible threat of the outside option being an important source of market power for the CEO. CEOs receive an abnormal increase in pay of about 6.4% to 6.6% following large tax increases, relative to CEOs who do not experience such tax shocks, controlling for other determinants of compensation. In contrast, CEOs do not experience a pay cut or slower growth in pay following a tax cut. The income tax effect is asymmetric, suggesting that adjustment frictions or CEO bargaining power prevent a downward response in pay. Finally, we provide new estimates of the responsiveness of CEO pay to federal tax changes. When the net-of-tax rate changes by 1% due to a federal personal income tax shock, CEO pay changes by approximately 0.272% to 0.298%.

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How Executive Compensation Changes In Response to Personal Income Tax Shocks (Who Pays the CEO's Income Taxes?)

1. Introduction

The level and structure of executive pay are complex, controversial concerns. Persistent interest among investors, regulators, politicians, and executives has spawned a substantial scholarly literature as well as a considerable compensation consulting industry. Both address the determinants, economic and otherwise, of the level and incentive properties of executive pay.

Per Edmans, Gabaix, and Jenter (2017), in their survey of the theories and empirical evidence on managerial compensation, the various empirical designs arise from at least three, non-mutually-exclusive perspectives: shareholder value maximization; rent extraction by executives; and institutional forces. The focus in the literature has been on the first two perspectives.

> Most recent analyses of executive compensation have focused on efficient-contracting or managerial-power rationales for pay, while ignoring or downplaying the causes and consequences of disclosure requirements, **tax policies**, accounting rules, legislation, and the general political climate. (Murphy, 2013; emphasis added)

We emphasize this third line of inquiry.

The few prior studies that have examined income taxes and executive compensation report negligible effects of *federal* income tax policy on managerial pay (Goolsbee, 2000a; Hall and Liebman, 2000; Rose and Wolfram, 2002).[1] Frydman and Molloy (FM, 2011, p. 1434) conclude that "(I)n summary, we have found little evidence that changes in tax rates are related to changes

[1] There is some other interesting work on taxes and pay. For example, Goldman, Henley, and Lewellen (2024) report that executive pay is positively related to *convexity* (progressivity) in the personal income tax schedule and the induced risk aversion arising from the associated concavity in after-tax pay.

in executive pay… ." In contrast, we investigate how exogenous changes in personal *state* income tax rates affect the level, composition, and incentive properties of CEO compensation in US firms.

Given the finding that federal income tax shocks have negligible effects, a reasonable null hypothesis is that there would be no change in executive pay in response to a change in personal state income tax. Moreover, insofar as state income tax changes tend to be smaller than federal tax rate changes, such state tax shocks may not be cognitively salient or economically relevant for highly-paid executives. Per the latter, the costs of bargaining for pay that compensates for the tax shock potentially are high relative to the pay to be gained. Finally, it is possible that top executives preemptively insulate themselves from state income tax changes by means of locational choices or other tax-avoidance tactics.

What do we find? We reject the null hypothesis of no effect on CEO pay. Our analysis indicates that the response of CEO compensation to state income tax changes is economically and statistically significant. Consistent with this result, we find that the supply curve for managerial input is substantially more elastic than the demand curve of the firm, the reason likely being that the CEO has credible outside options on the extensive margin. The effect is asymmetric. Tax increases lead to compensation increases, while tax decreases have no effect on pay. Finally, using recent data on comprehensive measures of executive pay, we find an economically modest though statistically significant effect of federal income tax changes on CEO pay.

As a point of departure, suppose that top executives and firms are assortatively matched based on attributes of each that are reciprocally-synergistic, costly-to-transfer, and differentiated (Rosen 1981; Tervio 2008; Pan 2017). Then there are at least two reasons why a change in personal tax rate would affect the level of executive pay. First, setting aside bargaining power for a moment, higher income taxes can directly reduce executives' after-tax income, thereby shifting the supply

curve for executive input inward, which would imply upward pressure on CEO pay, especially if the demand curve for CEO input is inelastic. The version of the supply curve we have in mind includes both the intensive and extensive margins, though we think of the intensive margin as largely irrelevant. CEOs have significant span of control and demands on their time and rise to the apex of the organization because they supply maximal feasible managerial input. The participation decision, in contrast, is likely to matter. By this we do not mean whether the CEO decides to leave the labor market. Rather, the location and shape of the supply curve will depend on the external opportunities, *if any*, the CEO has for top management positions at employers in alternative, low-tax domiciles, and on the frictions, benefits, and costs to the CEO of switching.[2,3]

Second, other considerations may affect the ability of the firm and CEO to bargain over pay.[4] Firm and executive "endowments" are matched based on the potential reciprocal synergies arising from the characteristics and capabilities of the firm and manager. Then, for example, there can be a one- or two-sided holdup problem. Therein specific firm assets and a particular manager's specific human capital each cannot generate surplus without the other, so that bargaining power can be ascribed to one or both of the firm and manager (Hart and Moore, 1990). As a second example, a firm can have weak governance and executives can be entrenched. Perhaps the board

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[2] In the thin, lumpy market of matches, the demand curve for high-level managerial input (from a few CEO candidates or perhaps from a single individual), is likely to be inelastic. For CEOs, who have a small number of alternative job sites and face have significant costs of relocating, perhaps the supply curve also is inelastic. Which is relatively less elastic is an empirical question addressed below. Our main point pertains to upward pressure on CEO pay arising from an inward shift in the CEO supply curve arising from a state personal income tax increase.

[3] Top executives are attuned to differences in state tax rates and will threaten to relocate or will actually relocate in response. For example, California has high personal income tax rates, while Texas has no personal income tax (https://www.bizjournals.com/sanfrancisco/news/2020/11/17/california-exodus-roared-on-even-before-covid-hit.html). Moreover, top athletes in team sports have limited locational flexibility but are acutely aware of how income tax rates vary across jurisdictions. For an example, see reporting on NHL hockey players (https://www.wsj.com/sports/hockey/stanley-cup-low-tax-states-florida-panthers-7d15ecff?mod=hp_featst_pos4).

[4] It is likely that each matched firm-CEO pair will bargain over multiple other aspects of employment. Those aspects potentially include managerial input and responsibilities and span of control and discretion over firm assets (and managerial pay), all within the "lens" defined by the firm's iso-value set and manager's indifference curve.

of directors is co-opted (Coles, Daniel, and Naveen, 2014) or otherwise not truly independent (Weisbach, 1988). Executives (firms) potentially can exercise bargaining power to increase (decrease) the pay of the CEO, relative to the conventionally understood intersection of supply and demand.

Over the 1992 – 2022 period there were 371 changes in the top marginal US state personal income tax rates, of which 116 were increases and 255 were decreases. Following Heider and Ljungqvist (HL, 2015), we focus primarily, though not exclusively, on the 46 "large" state tax rate shocks, meaning rate changes at least as large as one percentage point, including 27 tax increases and 19 tax cuts, in our sample (see Fig. 1). This approach is consistent with the possibility that large tax changes are more salient than small ones and that the bargaining and other costs associated with adjusting compensation in response to very small income tax rate changes are large relative to the benefits.

We apply two empirical approaches to the question of the effect of state personal income tax changes on pay. First, following the prior literature on federal income tax changes (e.g., FM 2011), we estimate the elasticity of CEO pay in the net-of-tax rate. Second, we apply a staggered difference-in-differences model to state income tax shocks.

For the former, following the approach in FM (2011) we regress the natural logarithm of the proportional change in managerial pay on the logarithm of the inverse of the ratio of post-tax-change (year *t*) *net-of-tax rate* (*NOT*) to the pre-tax-change (year *t-r*) net-of-tax rate, specifically $(1-\tau^{F}_{m,t-r}-\tau^{St}_{m,t-r})/(1-\tau^{F}_{m,t}-\tau^{St}_{m,t})$. The superscript denotes the federal (*F*) or state (*St*) personal income tax rate, *m* indexes the manager/CEO, and *t* and *t-r* index time. An estimate of the coefficient on the log of the NOT equal to one would indicate that the proportional change in executive pay exactly offsets the tax increase, making the executive whole after-tax and fully

shifting the incidence of the tax increase to the firm. Based on our estimate from the full sample of all state tax shocks, when the NOT changes by 1% due to a state personal income tax shock, CEO pay changes by approximately 0.730% to 0.906%. CEO pay increases within two years by an amount three-quarters or more of the way to full compensation of the CEO for the increased tax liability. Consistent with the incidence of the state personal income tax shock, the estimates of the elasticity of CEO pay in the net-of-tax rate indicate that the supply curve for CEO services is at least 2.70 times and perhaps as much as 9.64 times as elastic as the CEO demand curve.

In our DiD specifications, we use staggered state-level personal income tax changes as plausibly exogenous shocks to tax rates. Compared with federal tax changes, state-level changes in personal income taxes happen more frequently and do not affect all states at the same time. The staggered nature of state-level personal tax shocks potentially provides valid control firms as a set of counterfactuals for how executive compensation would have evolved without the tax changes. The treated group includes CEOs of firms headquartered in states experiencing large increases or decreases in top personal income tax rates. The control group includes the remaining CEOs in the sample. Because states can and do experience repeated tax shocks, we define our treatment variable to indicate the appearance of each tax shock, while using the first difference of control variables on the right-hand side (per Heider and Ljunqvist, 2015). Our estimates show that CEOs receive economically and statistically higher pay two years after a large (≥1%) increase in personal income tax rates. Specifically, CEOs receive an extra increase in pay of 6.4% to 6.6% following large tax increases, relative to CEOs who do not experience such tax shocks, controlling for other determinants of compensation. The effect is asymmetric. In contrast to tax increases, the effect of a state income tax cut is statistically and economically insignificant. Thus, regardless of the direction of the change in tax rate, on average the CEO is never a loser.

The DiD results survive various hurdles for credible identification. First, we investigate whether state tax changes arise from prior rapid growth in executive pay. They do not. This is consistent with the finding of Romer and Romer (2010) that tax changes after 1975 are unlikely to be endogenous. As a second check, we further remove political considerations by performing our tests using only exogenous tax shocks, as determined using a narrative approach (Romer and Romer, 2010; Giroud and Rauh, 2019). Our findings are the same.

Third, a potential concern is that both state tax changes and executive pay changes can be affected by local economic conditions. Our baseline setting includes control firms that are not geographically proximate to the corresponding treated firms. Exploiting the fact that local economic conditions tend to be relatively similar in bordering states, we use a control group including only CEOs of firms headquartered in bordering states that do not experience any tax shock. This neighboring control group establishes the counterfactual response of CEO compensation to the unobserved local factors excluding the effects of tax changes. The effect of tax changes on CEO pay is robust to the bordering-state setting.

Fourth, we verify that the treated and control groups have parallel trends in CEO pay changes before both positive and negative shocks to tax rates. Finally, we assess and then discard the possibility that our results on tax increases are attenuated towards zero by CEOs who avoid a state tax increase by a change in or the original choice of domicile.

We offer several related findings. First, named executive officers (NEO) who are not the CEO receive a much smaller pay increase of about 2.5%, about three-eighths of that of the CEO, in response to a large increase in personal income tax rate. Like CEO pay, NEO pay does not decline in response to a tax decrease. Second, the size of the pay response to a large state income tax change does not depend on governance (board structure, E-index), gender, or industry profitability.

Third, we address the finding in the prior literature that the sum of annual CEO salary and bonus does not respond to a federal tax change. Building on that influential prior work, our empirical advantages include more recent data, a comprehensive measure of CEO pay that includes stock and option awards, long-term cash, and perquisites in addition to salary and bonus, and a specification that accommodates a lagged response. We find that the elasticity of CEO pay in the inverse net-of-tax rate, based on a change in the federal personal income tax rate, of about 0.273. This figure, which indicates something like one-third of the responsiveness of CEO pay to state income tax (0.730 to 0.906), nonetheless is statistically significant. The likely reason for the smaller elasticity is that CEOs have no outside option (at least within the US) to avoid a federal tax change. In contrast, for a state tax increase a CEO's credible threat along the extensive margin necessitates a larger response from the firm. If the response to a federal income tax increase arises mostly from bargaining power and assuming the CEO has similar power to bargain over a state income tax shock, the value of the credible extensive margin is manifested in the difference in elasticities, 0.730 or 0.906 versus 0.273.

Directly analogous to our staggered DiD analysis of US state income tax changes, we use *international* data on staggered federal income tax shocks across 21 countries including the US. We find that that CEO pay increases by about 6.5% (6.7%) the first (second) year following a federal personal income tax increase. Mobility frictions do not appear to fully impair the ability of a CEO to relocate to another country with a lower income tax rate. Nonetheless, while these estimates appear to be large, when normalized by the size of the tax changes the response to US state personal income tax shocks is larger than to federal shocks. Finally, like state income tax decreases in the US, we find that federal tax decreases, across the 21 countries, do not lead to a decrease, relative to benchmark, in CEO pay.

Our analysis contributes directly to at least two segments of the literature. First, we advance the literature on incentive compensation and governance. Our results indicate that the demand curve for managerial input is highly inelastic relative to the supply curve, that CEOs likely have significant power in bargaining with the firm, and that CEOs obtain from their employer a large position of the increase in state tax. The firm pays for the bulk of a state personal income tax increase. Raising executive pay in response to a tax rate increase likely means paying at least some of the executive's tax bill with shareholder money or funds from other claimants. In contrast, a change in CEO pay does not follow decreases in state personal income tax rates.

Second, we provide new evidence on the effect of federal taxes on executive compensation that builds on prior literature. Previous studies on the topic, relying on time series variation in the top federal personal tax rate report that changes in income tax rates have negligible effects on CEO compensation (FM 2011; Goolsbee, 2000; Hall and Liebman, 2000; Rose and Wolfram, 2002; Frydman and Malloy, 2011). Our results differ. We find that CEO pay responds significantly to federal personal income tax shocks, both in the US and 20 other countries. The reasons why our results differ from prior literature appear to include using broader measures of executive pay and response lags in the regression specifications. In terms of the more recent sample period, it is likely that mobility frictions, which historically were substantial, have declined.

2. Empirical Design

We use two approaches to examine the changes, if any, in CEO pay in response to changes in top personal state and federal income tax rates. We estimate (1) the elasticity of the change in compensation to the net-of-tax rate, and (2) a staggered differences-in-differences (DiD) model.

2.1. The Elasticity Model

We estimate the elasticity of CEO compensation with respect to the factor that captures what is left after income taxes, the net-of-tax rate. This elasticity formulation closely resembles that in the prior literature on federal personal income tax shocks (e.g., FM, 2011). We focus on state personal income tax changes but consider federal tax shocks in some models. We can include both increases and decreases in tax rates and can address large and both large and small tax shocks together.

Let $y_{m,t}$ be nominal period t compensation of CEO m and let $\tau_{m,t}^{F}$ and $\tau_{m,t}^{St}$ be the federal and state tax rates applicable to CEO m in period t. Assuming a flat tax, for simplicity, after-tax, period-t pay of the CEO of the firm is $y_{m,t} \cdot (1 - \tau_{m,t}^{F} - \tau_{m,t}^{St}) = y_{m,t} \cdot NOT_{m,t}$, where $NOT_{m,t} \equiv (1 - \tau_{m,t}^{F} - \tau_{m,t}^{St})$ is the "net-of-tax" rate which, when applied to taxable income, determines after-tax income. Let $g_{m,t}$ be the growth rate for the pay of the CEO in market equilibrium. The rate $g_{m,t}$ should depend on firm accounting or market performance, size, asset tangibility, inflation rate, performance of industry competitors, other factors, and on CEO characteristics as well. Suppose that $(1 + g_{m,1})y_{m,0}$ is the appropriate benchmark for the CEO's pay in period 1, based on initial pay $y_{m,0}$, in the absence of any tax rate changes.

Now allow for income tax shocks. Let $\hat{y}_{m,1}$ denote the nominal pay of the CEO in period 1 that makes the CEO whole after-tax, holding all else constant: $\hat{y}_{m,1} \cdot (1 - \tau_{m,1}^{F} - \tau_{m,1}^{St}) = \left(1 + g_{m,1}\right) \cdot y_{m,0} \cdot (1 - \tau_{m,0}^{F} - \tau_{m,0}^{St})$, or identically, $\hat{y}_{m,1} \equiv \left(1 + g_{m,1}\right) \cdot (NOT_{m,0}/NOT_{m,1})y_{m,0}$. Dividing both sides by prior pre-tax pay, and allowing that tax rate changes can affect pay potentially with a lag, suggests the following specification to estimate the effect on CEO pay of a change in the personal income tax rate:

$$Ln\left(\frac{y_{m,t}}{y_{m,t-1}}\right) = \beta_0^q + \beta_{-2}^q Ln\left(\frac{NOT_{m,t-3}}{NOT_{m,t-2}}\right) + \beta_{-1}^q Ln\left(\frac{NOT_{m,t-2}}{NOT_{m,t-1}}\right)$$

(1)

$$+ \Delta X^{q}_{m,f,t-1} \cdot \Gamma^{q} + \mu^{q}_{m,f} + \vartheta^{q}_{ind,t} + \varepsilon^{q}_{m,t},$$

where *m* is the CEO index, *t* is the time index, *f* is the firm index, *ind* is the industry index, *y* is CEO compensation, and $NOT_{m,t}$ is the after-tax rate as defined above. The superscript $q = St$ signifies the data and parameter estimate are based on state personal income tax shocks, while $q = F$ would indicate estimates are based on federal tax changes. In addition, Δ is the first difference operator (within CEO-firm), $X^{q}_{m,f,t-1}$ is the vector of control variables (including characteristics of the firm that employs the CEO), Γ^{q} is the coefficient vector for the control variables, $\mu^{q}_{m,f}$ is the CEO-firm fixed effect, $\vartheta^{q}_{ind,t}$ is the industry-year fixed effect, and $\varepsilon^{q}_{m,t}$ is the error term. Some models require simpler fixed effects, such as for each of CEO and year. The control variables in *X* can be transformed using the natural logarithm function, scaled, or not transformed at all. Here and throughout $\Delta X^{q}_{m,f,t-1} \cdot \Gamma^{q} + \mu^{q}_{m,f} + \vartheta^{q}_{ind,t}$, $q = St$ or *F,* is meant to capture determinants, other than tax rate changes, of the change in CEO pay.

We consider changes in CEO compensation both one and two years after shocks to top state (or federal) personal income tax rates. Benchmarking and pay-formation processes used by many listed US firms generally include lags in data and response.[5] The new compensation contract will be effective no earlier than year *t+1* or perhaps more likely one more year later, in year *t+2*.

[5] The human resources director and board compensation committee, often in collaboration with a compensation consultant, set pay based on lagged pay data for size- and industry-based comparison firms and with a lag in pay determination based on those data (Murphy, 1999). The compensation consultant will collect compensation data on the various positions (CEO, CFO, SVP, Chief Legal Officer, Division Head, SVP, etc.) from those comparable companies and, as the benchmark, pick the median, mean or appropriate percentile, based on where the board determines the executive resides in effectiveness and performance relative to peer executives. To formulate contemporaneous benchmarks for setting pay, many firms apply an annual inflation factor, such as the 5% often suggested by compensation consultants, to the lagged benchmark data for overall pay and the components of pay.

Accordingly, we expect a lag of at least one year and more likely two years for a response, if any, to a change in the personal income tax rate.[6]

For state tax changes we expect the estimate of β_{-2}^{St} to be positive because an increase (decrease) in the state personal income tax rate implies an increase (decrease) in the inverse *NOT* ratio, $NOT_{m,t-3}/NOT_{m,t-2}$. If compensation responds sooner, β_{-1}^{St} should be positive. In any case, the estimated coefficient from Equation (1) is the **negative** of the elasticity of executive pay in the inverse net-of-tax rate, $-\beta_{-k}^{St} = \varepsilon_{y,NOT}^{St} \equiv (NOT/y)(dy/dNOT)$, where the superscript *St* on $\varepsilon_{y,NOT}$ indicates that the elasticity estimate is based on state tax shocks. The estimated coefficient would be opposite in sign if we perform the regression analysis based on $NOT_{m,t-k}/NOT_{m,t-k-1}$ rather than the inverse after-tax ratio used in Eqn. (1).

Note that the effect of a state tax rate change on the inverse net-of-tax ratio depends on the level of the federal tax rate. In our sample period, there are six large (at least one percentage point) US federal income tax changes.

2.2. Staggered Differences-in-Differences

In a DiD analysis based on a single event, the treatment variable is usually set to one in years after the event (as illustrated in the upper panel of Appendix 2, Figure S1). In our analysis, however, there are multiple shocks to tax rates through time and there can be repeated shocks in one state. For example, one tax increase may be followed by another tax increase or decrease in the same state in the future. In this case, a single treatment dummy equal to one after the first shock would fail to capture the subsequent shocks (lower panel of Figure S1).

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[6] In the US, personal income taxes in year *t* usually need to be paid by April (or no later than October) in year *t+1*, when any liquidity issue arises from the need to pay more income tax. The need for liquidity can motivate CEO option exercises and equity sales, which in turn can motivate the compensation committee of the board of directors to recalibrate the CEO's compensation contract.

One way to accommodate repeated events is to set the treatment variable as a count variable, or equivalently, use the first differences of all variables (including the treatment variable) in the DiD analysis (HL 2015). Accordingly, we define a dummy variable, *Tax Increase* (*Decrease*), which equals one if a large tax increase (decrease) occurs in the headquartered state in a year, and zero otherwise, where a large tax change refers to a change greater than one percentage point. This is equivalent to the first difference of a count variable and captures all large tax shocks in a state (lower panel of Figure S1). In our DiD analysis we use the first differences of variables to estimate:

$$\begin{aligned}\Delta Ln(y_{m,t}) = \beta_0^q + \beta_{-2}^{I,q} \cdot Tax\ Increase_{m,t-2} + \beta_{-1}^{I,q} \cdot Tax\ Increase_{m,t-1} \\ +\beta_{-2}^{D,q} \cdot Tax\ Decrease_{m,t-2} + \beta_{-1}^{D,q} \cdot Tax\ Decrease_{m,t-1} \\ +\Delta X_{m,f,t-1}^q \cdot \Gamma^q + \mu_{m,f}^q + \vartheta_{ind,t}^q + \varepsilon_{m,t}^q,\end{aligned} \quad (2)$$

where the superscript *I,q* (*D,q*) indicates a state (*q* = *St*) or federal (*q* = *F*) tax increase = *I* (decrease = *D*). The other components on the right-hand side are defined as above. Again, $\Delta X_{m,f,t-1}^q \cdot \Gamma^q + \mu_{m,f}^q + \vartheta_{ind,t}^q$ is meant to capture determinants, other than tax rate changes, of the change in CEO pay. The β coefficients show the treatment effects in the DiD analysis. For example, when *y* is CEO compensation, a significantly positive $\beta_{-2}^{I,St}$ would indicate that CEO compensation increases significantly two years following an increase in the state personal income tax rate.

3. Sample Construction

For the US sample, we obtain data on personal income tax rates from the official website of the Tax Policy Center (https://www.taxpolicycenter.org). CEOs generally have high income, so for any state we use the change in the top personal marginal income tax rate. As Panel A of Table 1 reports, over the period 1992 – 2022 there were 1,581 (= 51 x 31) state-years (including

Washington, DC) and 371 changes in the top state personal income tax rate. Of these, 116 (255) were increases (decreases), while 46 (325) were large (small) changes of at least (less than) one percentage point. Following Heider and Ljungqvist (HL, 2015), we focus primarily, though not exclusively, on the 46 large tax rate shocks, meaning rate changes at least as large as one percentage point, including 27 tax increases and 19 tax cuts, in our sample (see Fig. 1). Treated firms are those headquartered in states experiencing large tax shocks or, in some instances, any income tax shock (large or small). The various control firm samples are defined by firms headquartered in states that: did not have a contemporaneous large tax shock; never had a large or small state income tax shock at any time in the sample period; or did not have a contemporaneous small income tax change.

Appendix 1 displays variable definitions. We obtain compensation data from Execucomp, corporate accounting data from Compustat, and insider trading data from Thomson Reuters. In our analysis we assume firms' executives live in the states where their offices are located.[7] We extract the information on the location of firms' executive offices directly from SEC 10K filings. To identify the relevant state for personal income tax rates, we use the "Mail Address" in 10K filings, which is the HQ address or the "Address of principal executive offices" for the firm.

Our sample reflects the merged intersection of the Execucomp and Compustat datasets. We only include CEOs who have worked in their current positions more than two years, so that their compensation in the current firms can be affected by the tax changes in the past couple of years and that CEO moves across firms do not contaminate the compensation data. Starting from 47,083 CEO-firm-year observations, we drop 12,745 because the CEO has less than 2 years of tenure,

[7] In 99.3% of cases in our sample the CEO owns a residence in the state where the corporate headquarter is located.

5,765 by eliminating firms that change state of domicile, 425 when the firm has less than $50 million in market equity, and 5,857 from banks and utilities. Accordingly, over 1992–2022, the final sample includes 22,291 CEO-firm-year observations. Panel B of Table 1 reports additional summary statistics. About 2.6% and 1.3% (5.1% and 13.5%) of CEO-year observations reflect a large (small) increase or decrease, resp., in the CEO's top personal income tax rate.

For compensation measurement, we use the method described in Coles, Daniel, and Naveen (2013). We deploy their code[8] to calculate the value and incentive properties of cash, equity, and option awards to executives and the value and incentive properties of the accumulation of those awards (net of dispositions) as they comprise the executive's portfolio. The average CEO in our sample earns US$5.88M per year: $769K in salary, $335K in annual cash bonus; $837K in non-equity cash incentive pay; $1.97M in stock; $1.61M in options; and perquisites valued at $237K.

Following the existing compensation literature, we control for the book value of assets, market-to-book ratio and CEO-firm performance (ROA) in our tests. For firm-related control variables, the firm-year averages in our sample are $6.489B for book assets and 2.189 for market-to-book.

We also collect data for CEOs and their firms for federal tax changes in 20 additional countries. CEO compensation data are from Incentive Lab Europe, which covers countries and regions including Great Britain, France, Switzerland, the Netherlands, Hong Kong, and Singapore. Panel C reports the summary statistics for the international sample including US and non-US firms. About 8.0% and 7.7% of CEO-year observations reflect a large increase or decrease, respectively, in the top personal federal income tax rate faced by the CEO. The average CEO in this sample earns US$5.95M per year: $878K in salary; $98K in cash bonus; $1.15M in non-equity incentive

[8] See https://astro.temple.edu/~lnaveen/documents/deltavega_2013.sas. We thank the authors.

pay; $2.83M in stock; $788K in options; and perquisites valued at $227K. For firm-related control variables, the firm-year averages in our sample are $9.807B for book assets and 2.144 for market-to-book. In general, we include CEO-firm and industry-year fixed effects, to control for the CEO-firm match and time-series effects common to firms, managers, and industries.

4. The Elasticity of CEO Compensation in Personal Taxes

To assess the responsiveness of CEO pay to personal taxes, we estimate the elasticity of CEO compensation with respect to the factor that captures what is left after income taxes, the net-of-tax rate. This elasticity formulation closely resembles that in the prior literature on federal personal income tax shocks (e.g., FM, 2011). We consider both federal level and state level changes in personal income tax rates, include both increases and decreases in tax rates, and address large tax shocks and both large and small tax shocks together. [9]

4.1. Estimates of the elasticity of CEO compensation in the net-of-tax rate

Table 2 reports the results. We include the obvious control variables and CEO-firm and industry-year fixed effects. Federal income tax changes do not add noise to the experiment. Federal tax changes apply to all CEOs in a year and should be washed away by time fixed effects.

Column 3 includes large and small state tax changes. It is possible that all tax rate changes, large or small, matter for CEO pay. The estimated coefficients on the inverse net-of-tax rate, however, are both statistically insignificant: $\beta_{-2}^{St} = 0.405$ (t = 1.20) and $\beta_{-1}^{St} = 0.315$ (t = 0.75). The sum of the two estimates is an economically significant $\beta_{-2}^{St} + \beta_{-1}^{St} = 0.720$.

[9] The income tax in the US can include three parts: federal, state, and local. In contrast to federal and state income taxes, local income taxes are low (most local income tax rates are between 1% to 3%, with a few exceptions, including the District of Columbia, with the income tax rate ranging from 4% to 8.5%). More information is available at https://taxfoundation.org/local-income-taxes-city-and-county-level-income-and-wage-taxes-continue-wane/. We approximate the income tax rate as the sum of federal and state income tax rates and ignore local income tax.

Columns 1 and 2 show the results for large (≥1%) salient tax rate changes. We remove small state tax shocks by setting the maximum state tax rate (and NOT) in the adjacent following year to be equal to the earlier of the two years. That is, for Columns 1 and 2, which are focused on large shocks, we set $NOT_{m,t-k}/NOT_{m,t-(k-1)} = 1$ for all observations for which the tax rate change was less than one percentage point. This immunizes the analysis of large state tax shocks from contamination by small state tax rate changes.

The estimates on the lagged response coefficients are $\beta_{-2}^{St} = 0.906$ and 0.730. That is, Columns 1 and 2 indicate that a 1% decrease in the net-of-tax rate due to a state personal income tax rate increase is associated with a 0.906% ($t = 2.30$) and 0.730% ($t = 2.01$) increase in total compensation two years later, respectively. An estimate of 1 would be consistent with an increase in pay that makes the CEO exactly whole in terms of after-tax pay. Both estimates indicate that the CEO is substantially compensated two years later for a change in state personal income tax rate.

To illustrate further the economic significance of the parameter estimate, suppose the state or federal income tax rate (or the sum of those rates) goes up by 0.01 from period $t-3$ to $t-2$. Assume that prior to the tax increase that the federal and state rates are the CEO-year averages in the sample, 36.4% and 5.3%, respectively, so the federal and state rates sum to 0.417 at $t-3$ and 0.427 at $t-2$. Then $Ln(NOT_{m,t-3}/NOT_{m,t-2})$ becomes 0.0173 rather than 0 (which the logarithm of the inverse net-of-tax ratio would be if there had been no tax rate change). Using the elasticity estimates from Columns 1 or 2 implies a 1.57% (i.e. 0.906 x 0.0173) and 1.26% (0.730 x 0.0173) proportional increase in CEO pay.

4.2. Supply and demand elasticities for CEO input.

We consider whether there is a combination of standard supply and demand effects that accommodate the empirical results. To do so we address whether the estimate of $\beta_{-2}^{St} = -\varepsilon_{y,NOT}^{St}$

is consistent with plausible demand and supply conditions for CEO "labor" as a function of "wage." (q = *St* indicates that the elasticity estimate of $\varepsilon_{y,NOT}^{St}$ is based on state personal income tax shocks.) Denote equilibrium executive compensation as y, the sum of the federal and state tax rates as $\tau = \tau_f + \tau_s$, and CEO pay after income tax as $y \cdot (1-\tau) = y \cdot NOT$. Denote the demand function of the firm for executive "labor" or input as $D(y)$ and the executive's supply function as $S(y \cdot NOT)$. In partial equilibrium in the executive labor market, $D(y) = S\big(y \cdot (1-\tau)\big) = S(y \cdot NOT)$ determines the equilibrium level of compensation for a given net-of-tax rate.

Suppose that there is a shock to the net-of-tax rate. The shock could be an increase (a reduction) in federal or state tax rate, in which case NOT would fall (rise). To assess the effect of the tax shock on equilibrium pay, totally differentiate the expression equating demand and supply in y and NOT to get $D'(y) \cdot dy = S'(y \cdot NOT)[y \cdot dNOT + NOT \cdot dy]$. Rearranging gives $\varepsilon_{y,NOT}^{St} = -\varepsilon_S/(\varepsilon_S - \varepsilon_D)$, where $\varepsilon_{y,NOT}^{St} \equiv (NOT/y) \cdot (dy/dNOT)$ and the supply and demand elasticities in the CEO labor market are $\varepsilon_S \equiv y \cdot NOT \cdot S'(y \cdot NOT)/\, S(y \cdot NOT)$ and $\varepsilon_D \equiv y \cdot D'(y)/\, D(y)$. For $\varepsilon_S \in [0, \infty)$ and $\varepsilon_D \in (-\infty, 0]$, then $\varepsilon_{y,NOT}^{St} = -\varepsilon_S/(\varepsilon_S - \varepsilon_D) \in [-1,0]$.

Note that both of the estimates of $\varepsilon_{y,NOT}^{St}$ from Table 2, - 0.906 from Column 1 and - 0.730 from Column 2, fall inside this interval. The estimated value of $\varepsilon_{y,NOT}^{St}$ = - 0.906 indicates that the supply curve for CEO input is almost ten times as elastic as the supply curve ($\varepsilon_S^{St} = -9.6383\ \varepsilon_D^{St}$). Using $\varepsilon_{y,NOT}^{St}$ = - 0.730 gives $\varepsilon_S^{St} = -2.7037\ \varepsilon_D^{St}$. Restated, the elasticity of demand is about one-tenth (three-eighths) as elastic as the supply curve, with $\varepsilon_D^{St} = -0.1038\ \varepsilon_S^{St}$ ($\varepsilon_D^{St} = -0.3688\ \varepsilon_S^{St}$). Having co-located the assortative match between the firm and CEO by means of the firm-CEO fixed effect, for both estimates based on large tax shocks the demand curve for CEO input appears to be highly inelastic relative to the supply curve. The relatively elastic supply curve is consistent

with the high responsiveness of CEO pay to state personal income tax shocks. If human capital is more mobile or redeployable than the assets of the firm, the supply curve would be relatively more elastic than the demand curve.

4.3. Reexamination of federal personal income tax shocks

Frydman and Malloy (2011), using a sample of top executives in 50 large firms from 1946 to 2005, find very little response in the annual salary and bonus of top executives to changes in federal tax rates on labor income. Other previous studies on the topic, relying in like manner on identification by time series variation within firms, report that changes in income tax rates have negligible effects on CEO compensation (Goolsbee, 2000; Hall and Liebman, 2000; Rose and Wolfram, 2002).

Using the elasticity specification from the prior literature, as deployed above, we reexamine the elasticity of CEO pay to the to the inverse net-of-tax rate. Table 3 reports the results. Four models (1 - 4) do not exclude state tax changes from the inverse NOT calculations. Those shocks, while generally much smaller than federal income tax shocks, allow some noise to remain in the analysis of federal tax shocks. The other four specifications (5 - 8) remove state tax changes by setting the state tax rate equal to the state top income tax rate in the prior year. If there is no federal tax shock, the inverse net-of-tax ratio will always equal 1 regardless of whether there was a state tax shock. The inverse NOT, while depending on the level of the state income tax rate, will increase (decrease) only if there is an increase (decrease) in the federal rate. Our reading of the prior literature is that those studies calculated the NOT based only on the federal tax rate. There are 6 changes in the top US federal personal income tax rate in our sample period, ranging from -3.6% to 8.6%.

Prior studies, based in part on historical data availability and the reality that stock and options have become only recently a significant component of executive pay, tended to use annual salary and bonus as the pay measure. FM (2011) include initial pay in some specifications, so we do as well, along with other control variables. Columns 1 and 2 report an insignificant estimate for the elasticity of executive annual salary and bonus in the inverse NOT lagged once and twice. Based on neutralizing state tax shocks, columns 5 and 6 report generally insignificant elasticity estimates. These estimates are largely consistent with the prior literature.

Compensation measured as TDC1, which includes stock and option awards, long-term cash bonuses, and perquisites, along with annual salary and bonus, gives rise to four economically and statistically significant estimates on the inverse NOT ratio lagged once. The estimates of $-\varepsilon^F_{y,NOT}$ vary across models 3, 4, 7 and 8 from 0.272 to 0.298. These results differ from the prior literature for a combination of reasons, including: our sample period is 1992-2022 versus, for example, 1946-2005 (Frydman and Malloy, 2011); we use different measure of compensation that includes long-term-cash and stock and option awards along with annual salary and bonus; our treatment of state income tax shocks; and the inclusion in prior studies of non-CEO NEOs along with CEOs.

What do our estimates imply for the elasticities of supply and demand for managerial input? Note that both of the estimates of $\varepsilon^F_{y,NOT}$ from Table 3, - 0.272 from Column 4 and - 0.298 from Column 7, fall inside the [-1,0] interval. The estimated value of $\varepsilon^F_{y,NOT}$ = - 0.298 indicates that the demand curve for CEO input is approximately 2.7 times as elastic as the supply curve ($\varepsilon^F_D = -2.676\ \varepsilon^F_S$). Using $\varepsilon^F_{y,NOT}$ = - 0.272 gives $\varepsilon^F_D = -2.356\ \varepsilon^F_S$. A relatively inelastic supply curve for CEO input is consistent with the reserved responsiveness of CEO pay to federal versus state personal income tax shocks.

A likely explanation for the difference in relative demand versus supply elasticities for federal versus state tax shocks is that outside alternatives for CEO employment elsewhere in the US that avoid the federal tax shock are unavailable relative to those that avoid a state income tax increase. Nonetheless, the CEO pay response to a federal income tax shock, while modest compared to the response to state income tax shocks, is economically and statistically significant. If the outside option is not credible in the US, then one interpretation is that CEOs otherwise possess significant influence and bargaining power in the pay-setting process.

Suppose that $\varepsilon_{y,NOT}^{St}$ (= -0.730 to -0.906) captures both the shift in the supply curve and other CEO versus firm bargaining power and that $\varepsilon_{y,NOT}^{F}$ (= -0.272 to -0.298) is an upper bound on bargaining power in the absence of the outside option. Then one can think of the difference in state and federal elasticities [either -0.906 – (-0.298) = -0.608 or -0.730 – (-0.272) = -0.458] as representing the limited relevance of locational frictions and corresponding importance of the extensive margin, as manifested in the CEO supply curve in the US.

5. Staggered DiD: The CEO Pay Response to Personal Income Tax Rate Changes

To further assess the response of CEO compensation to a change in the personal state income tax rate, we apply the empirical lens of a staggered difference-in-differences specification.

5.1. The Magnitude and Timing of the Compensation Response to Tax Shocks

The primary treatment group is CEOs at firms in states with a personal state income tax shock greater than or equal to 1%, up or down. The "**base**" control sample is CEOs at firms in states that did not have a *large* personal state income tax shock. Note that this control sample muddies the waters, insofar as it does include CEOs in states that had a "contemporaneous" small personal state income tax shock. Accordingly, following de Chaisemartin and D'Haultfoeuille (2020), we clean

the base control sample further by eliminating CEOs in firms in states that had any small personal state income tax increase during the sample period. This removes 6,728 CEO-firm-year observations from the base control sample to yield a smaller (15,563) "**spotless**" control sample.

The dependent variable is Δln(TDC1). Table 4 presents the results for the indicators for large tax shocks. Column 1 (2) shows the estimates of the effect on CEO compensation of tax increases (decreases) one year and two years prior. Column 3 includes indicator variables for both tax increases and decreases. The results show that CEO compensation significantly increases two years after a large tax increase. For example, controlling for other determinants of pay changes, Column 1 (3) shows that CEO compensation increases by 6.4% (6.6%) two years after a state personal income tax increase. We observe no significant changes in compensation in the adjacent lagged year of a tax increase. On average it takes two years for CEO pay to adjust following a tax increase. Again, one likely reason for the large increase is that the demand for CEO services is inelastic relative to the supply curve.

In stark contrast, there is no decrease in compensation following a tax decrease. As Columns (2) and (3) report, the estimated coefficients on the lagged and twice-lagged tax decrease indicator variables are close to zero and insignificantly different from zero. See Figure 2.

These estimates for large state personal income tax shocks are based on the noisier control sample that includes small state income tax shocks. For a sharper specification, we use the spotless control sample. While this reduces the overall sample of treated and control CEO-firm observations from 22,291 to 15,563, nonetheless Model 4 (6) of Table 4 indicates that CEO compensation increases by 7.2% (7.4%) two years after a state personal income tax increase.

These coefficients are somewhat larger, with lower *p*-values, than those in Models 1 and 3.[10] For context, note the mean (1.95%), minimum (1%), and maximum (3.95%) of large state tax increases in our sample. The estimate of 7.4% is 3.79 times the average large state tax shock and 2.51 times the range of large tax shocks.

The spotless control sample does not alter the finding of asymmetry. In Models 5 and 6 the estimated coefficients on the lagged and twice-lagged tax decrease indicator variables continue to be economically and statistically insignificantly different from zero.

To fully frame the pay results for tax decreases, note that a reduction in nominal pay would not necessarily be required, all else equal, to equate after-tax CEO pay before and after a tax reduction. The specifications in Table 4 controls for normal *growth* in pay associated with firm performance, size, and asset composition, so a negative estimate on the tax cut indicator would mean that the growth in nominal CEO pay (in response to a personal income tax cut) need not be negative but could only be slower than otherwise expected. Thus, while frictions in the pay-setting process for adjustment of nominal pay downward may be larger than for escalating pay, such is an unlikely explanation for the lack of a downward abnormal response to tax rate decreases when benchmark pay grows for other reasons.

CEO power and entrenchment immediately arise as possible explanations. For example, perhaps the board of directors is insufficiently independent or even co-opted by the CEO (Weisbach, 1988; Coles, Daniel, and Naveen, 2014). Instead, if managerial input is more portable than fixed firm assets, then lower frictions or adjustment costs for the CEO versus the firm in

[10] Using the intermediate control sample, which excludes state personal income tax shocks that occur within the three-year window starting with any large state tax shock yields statistically significant estimates on the two lagged indicators of 6.6% and 6.7%. These figures, as well as the other parameter estimates, are similar in economic and statistical terms to those reported in Table 4. Moreover, for all of the results reported below, the estimates using the intermediate control sample are similar to those using the base and spotless control samples.

obtaining the next best outside option could explain downward rigidity. Similarly, in a thin market characterized by assortative matching, perhaps there are other causes for asymmetries in bargaining power. In any event, the estimates indicate asymmetric effects on CEO pay of tax increases versus tax decreases, all else equal.

We also investigate the compensation tax effects for non-CEO named executive officers. Columns 1 and 2 (Table 5) show that the effects on non-CEO NEO pay of state income tax changes, both one and two years prior, are statistically insignificant. Column 3 shows that, for an increase in state tax rate, the estimate of the response in non-CEO NEO pay to a state tax increase is the marginally significant 2.5%, about three-eighths of the response for CEOs, while decreases in the state tax rate have negligible effect on pay for both CEOs and other NEOs. In sum, neither tax increases nor decreases matter as much for non-CEO NEO pay. One plausible reason for the smaller effect of a tax increase is that non-CEO NEOs have less bargaining power than CEOs.

5.2. Tax Shocks and the Change in Components of Compensation

Figure 3 shows how the components of CEO compensation evolve over time, with stock pay becoming the largest component starting 2006. To examine the effects of tax changes on the components of CEO compensation following tax increases, we estimate the following model:

$$\Delta Ln(yc_{m,t}) = \varepsilon\beta_0^{St}{}_0 + \beta_{-2}^{I,St} \cdot Tax\ Increase_{m,t-2} + \beta_{-1}^{I,St} \cdot Tax\ Increase_{m,t-1} + \Delta X_{m,f,t-1}^{q} \cdot \Gamma^{q} + \mu_{m,f}^{q} + \vartheta_{ind,t}^{q} + \varepsilon_{m,t}^{q}, \quad (3)$$

where *m*, *f*, *ind*, and *t* index the CEO, firm, industry, and year, respectively, *yc* is the component of CEO pay (annual salary and bonus, long-term cash bonus, stock, options), and other notation is the same as in Eqn. (2).

Including controls and fixed effects, for $q = St$ both long-term incentive plan (LTIP) cash pay (Table 6, Col. 3) and stock pay (Col. 4) increase significantly two years following a large increase

in personal tax rates. For the base (spotless) control sample, two years after a large tax increase, LTIP cash pay increases by 10.9% (12.2%) and grant date fair value (GDFV) stock pay increases by 6.6% (6.0%), all else equal. In contrast, the associations between a state income tax increase and yearly salary, annual bonus, GDFV of options awards, and perquisites are negligible.[11]

6. Empirical Concerns and Additional Results.

6.1. Parallel Trends

For the DiD analysis, we check the parallel trends condition. We compare CEO pay changes [Δln(TDC1)] in the treated group and the control group in years around a shock (tax increase or decrease) to a state top personal income tax rate. We investigate large tax increases and tax decreases separately.

The parallel trends condition would be satisfied if the pay changes of the treated group are not statistically different from those of the control group in years prior to the tax increases, i.e. the difference between them is not statistically different from zero. In each year, relative to the event year, we calculate the CEO pay changes at the CEO-firm-year level (the dependent variable in our DiD regression analysis). We then take the yearly average within the treated and control groups, respectively, and calculate the difference between the two group-level yearly averages.

Panel A of Figure 2 plots the yearly differences. The blue dots represent the average yearly differences in CEO pay changes [Δln(TDC1)] between treated and control groups. The upper and lower bounds of the bars show the 90% confidence intervals. This figure shows that in years before the event year (year *t*), i.e. year *t-2* and year *t-1*, the differences between treated and control

[11] Untabulated results indicate that CEOs do not abnormally sell shares after a state income tax increase. Thus, the increase in stock awards does not appear to be "replacement "grants.

groups are not statistically different from zero, consistent with the parallel-trend requirement. The figure also illustrates the pay differences two years following the large tax increases. The only year in which treated and control firms have significantly different CEO pay changes is the year *t+2*, i.e. two years after a tax increase. CEOs in the treated group receive larger pay increases two years following a large tax increase compared with CEOs in the control group.

Panel B provides a similar figure for large tax decreases. The treated group includes CEOs of firms headquartered in states experiencing personal tax rate decreases of at least one percentage point. The figure shows that in years before the event year (year *t*) the differences between treated and control groups are not statistically different from zero, consistent with the parallel-trend requirement. Interestingly, the figure also shows that in years after a tax decrease there are no significant differences between treated and control groups. Unlike large tax increases, large tax decreases do not have significant effects on CEO compensation.

6.2. Changes in CEO Pay Do Not Precipitate State Income Tax Rate Changes

We use state-level income tax changes as plausibly exogenous shocks to the tax rates to study the effect of taxes on executive compensation. One important assumption is that executive pay changes do not cause tax rate changes. The potential issue would be that high growth in executive pay triggers regulatory intervention in the form of a higher marginal tax rate for high earners.

To assess this possibility, we carry out regression analysis in which the dependent variable is the indicator *Tax Increase* (*Decrease*) at the state level, which equals one if a state experiences an increase (decrease) in personal income tax rate greater than one percentage point in a year and zero otherwise. We use the linear probability model and consider the potential effect of CEO pay growth in a state one and two years prior, controlling for state characteristics including state debt, state GDP, tax revenues, cash savings, population, government indicator (democratic governor =

1, otherwise = 0), and unemployment rate. The test sample is at the state-year level and we include state and year fixed effects. CEO pay growth is the average change in firm-level CEO pay within a state-year. We have the relevant data for 1997-2021.

Table 7 reports the results. The coefficients on CEO pay growth in the previous two years are not statistically significantly different from zero for both tax increases and decreases. State-level personal income tax changes do not appear to be associated with prior CEO pay growth in the states, which alleviates this particular endogeneity concern.

6.3. Exogenous Tax Shocks Identified by a Narrative Approach

Another potential concern is that some omitted variables could lead to both tax changes and economic activities. Romer and Romer (2010) apply a narrative approach to classify tax changes larger than 1% into four categories based on the motivation of the tax changes: (i) offsetting a change in government spending; (ii) offsetting some factor other than spending likely to affect output in the near future; (iii) dealing with an inherited budget deficit; and (iv) achieving some long-run goal, such as higher normal growth, increased fairness, or a smaller role for government. They define the last two categories as exogenous tax shocks. Giroud and Rauh (2019) use the same approach and study the effects of state taxation on the reallocation of business activity. We follow the literature and only use the large tax shocks defined by the narrative approach as exogenous to form the treated group.[12]

Table 8 reports the results. The results indicate a somewhat larger pay response than reported in Table 4. In particular, using the base (spotless) control sample, CEO pay increases by 6.8% to

[12] We thank Giroud and Rauh for making their classification of tax shocks publicly available. Their latest tax increases were in 2011. For the tax changes (greater than 1%) after 2011 in our sample, we manually collect the information and apply the narrative approach proposed by Romer and Romer (2010). The data are available from 1992-2021. The narrative approach identifies 38 out of the 46 large tax changes up to 2021 as exogenous tax shocks.

6.9% (8.1% to 8.3%) two years following a large increase in personal income tax rates. All four estimates are statistically significant. In contrast, there is no significant effect on pay for large tax decreases. The findings in Table 4 are robust to using the narrative approach.

6.4. Neighboring Control States Without Tax Shocks

A potential concern about our identification is that local economic conditions may affect both executive compensation and local tax policies. Such effects are not necessarily removed in tests in which treated and control firms can be in different states far away from each other. To address this concern, we restrict control firms to be located in bordering states. Such states are more likely than distant states to share similar local economic conditions. For a treated state with a large tax shock, we include as control states only bordering states that do not experience a contemporaneous large shock to the personal income tax rates (illustrated in Figure 4). This setting allows us to alleviate the concern about the effects of unobserved variation in local economic conditions.

Table 9 reports the results. The effects of tax increases on CEO pay remain positive and statistically significant [Columns 1 and 3 (4 and 6) for the base (spotless) control sample], while the effects of tax decreases remain insignificant [Columns 2 and 3 (5 and 6)]. The results in Table 4 are robust to using neighboring states to control further for local economic conditions.[13]

7. Do the Locational Choices of CEOs Attenuate the Estimates? [14]

One possible reason for the high responsiveness of CEO pay to state personal income tax shocks is that CEOs can threaten to quit for another position in a state with a lower top tax rate. If the

[13] We also perform robustness tests with neighboring states as control states in which we consider only tax shocks identified using the Romer and Romer narrative approach (Section 6.3). The results are robust and available on request.
[14] We thank Carola Frydman and Wayne Guay for bringing locational concerns to our attention.

costs of relocating are low, then such a threat is credible. The large, estimated response in CEO pay to a state income tax shock is consistent with low locational frictions and a credible threat by the CEO of moving to another job in a low-tax state.

Locational considerations, however, potentially have a countervailing effect. Some executives may already be taxed in another state or move to another state that differs from the firm's domicile and was not treated with an income tax shock. Some reciprocal state tax agreements can make this feasible.[15] This sort of prior locational choice would reduce the need for the firm to compensate the CEO for an increase in the state personal income tax rate and would attenuate our parameter estimates of the effect of a tax shock on CEO pay.[16]

We argue that such locational considerations are unlikely to attenuate significantly our estimates of the sensitivity of executive pay to changes in the personal state income tax rate. First, there are not many relevant state reciprocity agreements. As of the end of 2016, in 17 states including the District of Columbia, nonresident workers who live in reciprocal states did not have to pay state

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[15] For example, until 2017 Pennsylvania and New Jersey operated under a reciprocity agreement. If a Pennsylvania (New Jersey) resident worked in New Jersey (Pennsylvania), that person was taxed in their state of residence. Pennsylvania's top rate was 3.07% while the top rate in New Jersey was 8.97%. Pennsylvanians (New Jersey residents) who worked in New Jersy (Pennsylvania) paid a top rate of 3.07% (8.97%). All else (such as property taxes) equal, the incentive for a CEO of a Garden State firm to live in the Pennsylvania would have been substantial. States are fully aware of the incentive to shop for low-tax tax domicile and to source employment income in a low-tax state. Not surprisingly, the New Jersey abrogated the New Jersey side of the reciprocity agreement, though the Pennsylvania side remains. After nearly forty years, in September 2016 New Jersey Governor Chris Christie terminated the New Jersey agreement with Pennsylvania, effective January 1, 2017. While at the time Governor Christie's office declined to provide an estimate of the gain in tax revenue, a former State Treasurer of New Jersey estimated that ending the agreement could generate an additional $180 million annually for New Jersey. Since then, New Jersey has increased the top personal income tax rate further to 10.97% (2024). See https://www.inquirer.com/philly/news/politics/20160903_Christie__seeking_revenue__ends_40-year_tax_agreement_with_Pa_.html.

[16] On the other hand, many interstate tax agreements are asymmetric. For example, if a CEO worked in Arizona but lived in California, Indiana, Oregon, or Virginia, the CEO could ask for an exemption from Arizona state personal income tax and withholding of that tax. Then a tax increase in Arizona would not affect the CEO. The reverse is not true. If the CEO worked in California but was a resident of Arizona, California did not accord symmetric treatment. The CEO would pay state income tax to California. If the rate in the state of residence were higher than that in California, the tax paid to California would be credited towards the tax due in the state of residence and the CEO would pay any shortfall to the state of residence. In cases such as this, the effective top income tax rate is the higher of the two state tax rates.

taxes in the work state.[17] In 2016 there were 64 ordered state pairs with a one-way reciprocity arrangement, which was only 2.51% of the 2,550 possible one-way arrangements among 51 jurisdictions, the 50 states and Washington, DC. One-way reciprocity agreements are infrequent. Moreover, states have erected additional barriers to the locational approach to avoiding state income tax.[18]

Second, Duchin and Sosyura (2021) examine how remote management by CEOs affects their financial decisions and ability to create shareholder value. They define a "long-distance CEO" as one who commutes at least 50 miles each way to corporate headquarters and does not own a residence within 50 miles of headquarters. Because some corporate headquarters are farther than 50 miles from the nearest bordering state, such long-distance CEOs are likely to live in their work state. Thus, the set of long-distance CEOs should contain almost all CEOs who would be insulated from a state personal income tax increase in their work state, as well as other commuting CEOs who still would be subject to a state tax change. Duchin and Sosyura (2021) find 1,925 long-distance CEO-firm-years among US domiciled firms listed in the US over the period 2000 – 2020. Over that period there were 105,819 US-firm-year US listings, so the percentage of firm years with a commuter CEO is 1.82%. We view this small percentage as an upper bound on the proportion of CEOs who preemptively avoid a state tax increase in their work state.[19]

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[17] See https://www.thebalance.com/state-with-reciprocal-agreements-3193329.

[18] We have in mind, for example, New York's "convenience of the employer" rule. New York is one of several states with a statute that specifies whether an employee working from a home office outside of the state is liable for nonresident income tax. (See https://taxnews.ey.com/news/2020-2543-new-york-issues-guidance-on-the-nonresident-income-tax-liability-to-employees-working-temporarily-outside-of-the-state-due-to-covid-19.) Under this test, nonresident income tax applies if the employee is working outside of the state for the employee's own convenience rather than the necessity of the employer and the employee spends at least one day in New York in the calendar year. Conversely, if the remote work arises from the convenience or necessity of the employer, nonresident NY income tax does not apply.

[19] Moreover, as Duchin and Sosyura (2021) document, the costs to shareholders of a long-distance CEO include lower operating performance and, in some instances, material commuting costs (as disclosed in the DEF14A). Such costs and poor performance likely contribute to the low incidence of long-distance CEOs. Firms are likely to resist.

Third, as did Duchin and Sosyura (2021), we obtain the CEO residential address data used by Bernile, Bhagwat, and Yonker (2018).[20] In our sample, we find that in 99.3% of CEO-year cases the CEO owns a residence located in the same state as the corporate headquarters. While it is possible that some of these CEOs reside in another abode in a different state, almost all CEOs have the option to make their work state their tax domicile as well.

Fourth, assuming that in general a CEO must be proximate to corporate HQ for peak performance (per Duchin and Sosyura, 2021), we interact the tax shock with the distance to the nearest state line. If that distance is large, it is less likely that the CEO is domiciled elsewhere and thus would be insulated from the state tax shock. Then the estimated coefficient on the interaction term should be positive if the sample contains a material number of CEOs who are insulated from the tax shock. Columns 1 (base control sample) and 2 (spotless control sample) of Table 10 show that the interaction coefficient estimate is essentially zero.

In summary, it appears that our coefficient estimates on the effect of state personal income tax changes on CEO pay are unlikely to be attenuated by the presence in the sample of a significant number of CEOs avoiding taxes by way of prior locational choices.

8. Cross-sectional Heterogeneity: Governance, Profitability and Gender

Higher personal income tax rates decrease CEO after-tax pay and give the CEO reason to pursue higher before-tax pay through negotiations with the firm. In this section we investigate the cross-sectional heterogeneity in the effect of tax changes on CEO compensation. We focus on three

[20] We thank the authors of Bernile, Bhagwat, and Yonker (2018) for sharing their data on executives' home addresses.

dimensions: business profitability, gender, and governance. In all three cases, the results, excluded here for brevity, will be available on request.

8.1. The Role of Industry Profitability: Sharing a Larger Pie

The CEO potentially will find it easier to bargain for higher pay if the firm is more profitable. Such bargaining power arises from the argument that the CEO should be paid more for better performance and also from the notion that employees should share in a larger pie with shareholders. Moreover, a CEO in a more-profitable focal firm will be evaluated and benchmarked for pay relative to a more generous external benchmark based on comparison firms in the same industry that are similar in size and performance (Bizjak, Lemmon, and Naveen, 2008; Faulkender and Yang, 2010; Murphy, 1999). Thus, throughout our regression specifications have controlled for the change in profitability.

Furthermore, we interact the state income tax shock indicator with a dummy based on whether the firm is above or below the industry-level median profit margin [(Sales – COGS)/Sales] (two-digit SIC). The estimate for regression Equation (1) on the interaction term (without the state tax decrease dummies) indicates that the sensitivity of CEO pay to a tax increase does not depend on industry profitability in the manner hypothesized.

8.2. The Role of CEO Gender

The majority of US CEOs are male. If female CEOs have fewer outside options or less bargaining power, we expect female CEOs to have smaller pay raises in response to a state personal income tax shock. We estimate Equation (1), without the state tax decrease indicators, including

a term that interacts a gender indicator with the lagged-twice state tax increase dummy. The results show that the sensitivity of CEO pay to a tax increase does not depend on gender.[21]

8.3. Governance

Poorly governed firms potentially are more likely to capitulate to bargaining pressure exerted by the CEO. We measure governance using the E-index (Bebchuk, Cohen, and Farrell, 2009) and board independence (Weisbach, 1988). Neither variable has power to explain the sensitivity of CEO pay to state income tax shocks.

8.4. Other taxes

States, counties, and municipalities raise funds by various means, including personal income and property taxes. Texas, for example, offers a package of zero state personal income taxes but high property taxes. Hawaii, on the other hand, has low property taxes but high income taxes.

To assess whether the substitution between property and income taxes contaminates our results, we redo all tests while excluding all states with no personal income tax. The parameter estimates and conclusions are not materially different.

8.5. Overall

These null results across multiple cross-sectional dimensions, such as governance quality, industry profitability, and CEO gender, reinforce the interpretation that the pay response to personal income tax increases is a general feature of the market for executive talent, rather than one that is conditional on observable institutional or demographic characteristics. The absence of moderating effects suggests that the upward adjustment in pay operates through mechanisms that

[21] In a prior version of this paper, before updating the data from 1992-2018 to 1992-2022, the estimates from the same regression model were more positive for men than women and the difference was statistically significant. Updating the data increased the representation of women CEOs in the sample, which may be the reason we no longer find differences in the responsiveness of CEO pay to state personal income tax shocks between male and female CEOs.

are robust to differences in governance quality, industry conditions, or executive identity. Rather than reflecting opportunism in weakly governed firms or excess generosity in high-profit industries, the results point to a systematic shift in the compensation equilibrium following a tax shock, which is consistent with inelastic firm demand, elastic supply arising from credible CEO outside options, and frictions in downward pay adjustment. Therefore, these findings strengthen the interpretation that the incidence of tax increases is broadly borne by the firm, even in environments where bargaining power might be expected to be limited.

9. International Evidence: Staggered Federal Tax Shocks

It is possible that the US CEO has outside options for employment as a top executive in other countries with lower federal income tax rates. We assess this line of reasoning using international data. We further collect changes in the top federal personal income tax rate for 20 additional countries or regions across 2011-2022 period. Those countries and regions are Belgium, Bermuda, Canada, the Czech Republic, Germany, Denmark, Spain, Finland, France, Great Britain, Hong Kong, Ireland, Israel, Italy, Luxembourg, the Netherlands, Norway, Portugal, Singapore, Sweden, and the United States). Over the sample period there were 14 increases in 8 different countries and 9 decreases in 6 different countries. As our aim here is to investigate federal tax shocks, for US firms in this international sample, to alleviate the concerns about the confounding effects of state tax shocks, we exclude US CEOs experiencing state tax changes. [22]

The analogy with the DiD analysis for state income tax shocks across states (per Table 4) is strong. Accordingly, we repeat the analysis for our data on the 21 countries. The results are

[22] We remove non-US CEO pay outliers by truncating at the 97.5th percentile.

displayed in Table 11. Like state tax shocks in the US, pay is unresponsive downward when the federal tax rate declines. For federal tax rate increases, the parameter estimates indicate a significant positive response. In our sample of CEOs and firms in 21 countries, CEO compensation increases in response to an increase in federal income tax rates.

To compare the response in pay for US state tax shocks versus international federal tax shocks, we normalize by size of the tax change. The estimated coefficient is larger for international federal tax shocks, likely because those shocks are substantially larger than state tax shocks. We normalize the coefficients on the large state (Table 4) and federal (Table 11) income tax indicators for size. The twice-lagged US state (international federal) coefficient estimate of 7.4% (6.7%) is 3.79 (versus 1.61) times the average US state (international federal) tax increase, 3.96 (1.68) times the median, and 2.51 (1.03) times the range of large tax shocks. The response to the state tax increase appears to be larger per unit of tax increase than to international federal tax increases. The reason appears to be that outside employment opportunities for CEOs are more available in other states in the US versus other countries around the world.

10. Further Considerations

10.1. Data

Several items warrant brief attention. First, suppose a CEO switches firms. Such a move and the likely substantial change in compensation such a move generates (Coles, Li, and Wang, 2018) can reflect the elasticity of demand for CEO input and CEO versus firm bargaining power, though likely not CEO entrenchment.[23] Demand elasticity and relative bargaining power, as well as the

[23] Fee and Hadlock (2013) confirm that CEOs who move obtain higher pay and that the compensation change can be explained in part by the equity position forfeited at the prior employer and by the prior employer's performance.

location of the demand curve, potentially can vary across firms, such as the prior versus new employer. Accordingly, to better hold constant firm characteristics and to maintain the intersection of CEO and firm, we restrict observations on the change in compensation to include those for which the CEO stays at the same firm for the two years following the relevant change in the personal income tax rate.

Second, about 2.5% of our sample of CEO-year observations have a tax change in two consecutive years. First-differencing removes unobserved firm-specific fixed effects in the corresponding levels equation. Thus, our specification accommodates: repeated treatments (the possibility that a firm experiences a sequence of tax increases or tax cuts over its time in the panel); treatment reversals (a tax increase followed sometime later by a tax cut, or vice versa); manager turnover; and differences in firms' responses to tax changes. See Heider and Ljungqvist (2015).

Third, significant elements of our empirical analysis rely on the idea that changes in TDC1 (Execucomp), as adjusted per Coles, Daniel, and Naveen (2013), reflect pay adjustments that arise in response to changes in the personal income tax rates that are applied to taxable income. To examine this notion in more detail, note that total compensation includes some or all of annual salary, annual bonus, and long-term cash bonus, as well as the grant date fair value (GDFV) estimates for stock and option awards. While annual salary and bonus are part of taxable income in the year they are paid, the grant date fair values of stock and option grants need not be. Under standard time-based vesting, the receipt of stock and options occurs in the future, with the actual taxable date and taxable value possibly being uncertain at the time of the award.[24] Performance-

[24] A stock award is taxed at the ordinary rate at market value at the time it vests. If the executive holds the stock, then subsequent tax is based on the gain or loss since vesting at either the ordinary income tax rate or the favorable capital gains rate, depending on holding period since vesting. Most options are issued at the money and are taxed at exercise, with the ordinary rate applied to the difference between the market value of the stock acquired net of the exercise

vesting provisions (Bettis, Bizjak, Coles, and Kalpathy, 2010, 2018), under which the number of units of cash, stock, or options ultimately received depends on one or more accounting or market performance metrics, introduce additional uncertainty about actual taxable income.

Of course, in estimating the value of stock and option awards, compensation committees and consultants often apply standard SEC- and FASB-sanctioned methods to capture the range and likelihood of possible outcomes (Bettis et al., 2018). The very act of generating a grant date fair value to disclose requires some understanding of these uncertainties. Thus, GDFV potentially provides a reasonable estimate of the present discounted taxable value of those awards. Furthermore, even if GDFV is biased one way or another relative to the present value of taxable income, if the bias is similar from year to year then there is some hope that using the *change* in GDFV removes that bias, so that $\Delta Ln(y_{m,t}) = Ln(y_{m,t}) - Ln(y_{m,t-1})$ is a reasonable proxy for the change in the discounted value of taxable income. This reinforces the use of $\Delta Ln(y_{m,t})$ on the left-hand side of regression specifications.

10.2. CEO Delta Incentives

It is possible that executives would obtain the liquidity needed to satisfy the increased state tax bill by disposing of accumulated shares or options. On the other hand, there are transaction costs of doing so, and perhaps more relevant is that a sale or exercise and sale triggers tax on realized gains. In addition, sales of stock by a top executive require disclosure and can draw unwelcome attention to the executive and firm from investors, the media, and regulators. We find no evidence in the data that CEOs liquidate stock and options at a rate any higher than normal.

price. Again, if the executive continues to hold the stock, then subsequent tax is based on the gain or loss since exercise and either the ordinary income tax rate or the capital gains rate applies, depending on the holding period.

Note, however, that the change in tax rate affects managerial incentive alignment, even if the stock and option holdings of the manager remain unchanged. A standard measure of incentive alignment is delta, the sensitivity of CEO wealth to stock price arising from the accumulation of stock and options net of dispositions (Jensen and Murphy, 1990; Core and Guay, 2002). Higher delta can mean that managers will work harder or more effectively because managers share gains and losses with shareholders. If pre-tax delta is given by δ, and the appropriate state and federal tax rates on stock and option payouts as compensation are τ_s and τ_f, then *after-tax delta* is $\delta_{AT} = (1 - \tau_s - \tau_f)\delta$. We argue that it is after-tax delta that matters for the incentives of the manager, so an increase in τ_s or τ_f requires an increase in pre-tax δ, through additional awards of stock for example, to return post-tax δ_{AT} to the pre-tax-change level. That is, in addition to replacing liquidated stock, returning post-tax incentives to the prior level requires further adjustment in the pre-tax effective CEO ownership of the firm. This is one explanation for the reliance on abnormal stock and long-term performance contingent cash awards that comprise the bulk of the CEO pay response to a state tax increase, as documented in Table 6.

10.3. CEO Turnover

To further assess the importance of the extensive margin, we estimate the effect of a pay increase (or not), conditional on a state income tax increase, on the likelihood of CEO turnover. To assess the retention motive, we divide firms with CEOs who face a large increase in personal income tax rates into two groups. One group includes CEOs who receive a pay raise two years after a large increase in state personal income tax rate. The other group contains CEOs who suffer from a large tax increase but do not receive a subsequent pay increase. We find that the likelihood of CEO turnover in the pay-raise group is significantly lower than that in the no-pay-raise group. The same holds in a multivariate context that controls for performance of the CEO.

Is retention by means of a pay response good for the firm? We find that ROA and stock return are significantly higher for firms that increase CEO pay following a large personal income tax increase, after controlling for firm performance in the previous years. Put differently, if a firm does not increase CEO pay after a large state tax increase, firm performance tends to be worse. These findings are consistent with the idea that boards can offset negative compensation shocks unrelated to CEO performance/quality and, by doing so, retain valuable talent to facilitate good firm performance. The results described here in Section 10 are available on request.

11. Conclusion

We study the effect of tax policies on CEO compensation. Specifically, we utilize changes in state-level personal income tax rates in the US to investigate how increases and decreases in personal income tax rates affect CEO compensation. Two years after a large increase in the personal state income tax rate, the CEO receives significantly higher pay that offsets much of the cost of the tax increase. Specifically, CEOs receive an increase in pay of about 6.4% to 6.6% following large state personal income tax increases, relative to CEOs who do not experience such tax shocks, controlling for various other determinants of compensation. The form of the pay increase comes in both long-term cash bonuses and awards of stock in the firm. Our estimates indicate that a 1% decrease in the CEO's net-of-tax rate for large tax changes is associated with as much as a 0.730% to 0.906% increase in total compensation two years later. These results are consistent with a demand curve for CEO input that is highly inelastic compared to the supply curve. The extensive margin for CEO input confers significant market power to CEOs.

In stark contrast, we find that income tax rate decreases have minimal effects on CEO pay. The effects on CEO pay of tax increases and decreases are decidedly asymmetric. The lack of a

downside response in pay to a tax increase, controlling for other determinants of pay, suggests that CEOs are entrenched at least to some extent and possess and exercise bargaining power other than by means of credible outside employment options.

Edmans, Gabaix and Jenter (2017) list three perspectives as being particularly useful to understand managerial compensation: market forces and shareholder value maximization; executive bargaining power and rent extraction; and institutional forces, such as taxes. Our results reflect and inform all three of those perspectives. The combination of the strong effect of personal income taxes on pay, the magnitude of the elasticity of executive pay in the net-of-tax rate, the asymmetry in the effect of tax increases versus decreases, and the effects of taxes on the incentive properties of executive compensation suggest that both market forces and managerial bargaining power shape the way that CEO pay responds to personal income tax rates.

A question we are unable to address without more data is the incidence at the firm level of the shock to the supply curve of the CEO. The firm responds with higher CEO compensation, but we do not know the extent to which that cost is spread across shareholders, bondholders, other labor, other factors of production, customers, or suppliers. We leave this for future inquiry enabled by appropriate data.

Our analysis has implications for policy. For example, there are recent calls at the state and federal level to increase income tax rates on high earners, such as CEOs and other NEOs. Our results highlight the fact that whether changing income tax rates would reduce the inequalities in earnings between top executives and the median or rank-and-file worker depends on the elasticity of firm demand for each type of employee.[25]

[25] Supposing that a state uses a flat rate for the personal income tax, if the demand curve for CEO and other NEO input is more inelastic than the demand curve for rank-and-file employees, an increase in the flat state income tax rate likely

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will increase earnings inequality in the firm. Such factors also will determine the success of various other initiatives, including California Senate Bill 37, which would impose significant taxes on firms that have the largest gaps between the highest-earning and lowest-paid employees. California SB 37, the "Corporate Fair Share for California and Californians," originally proposed that large corporations that do business in California would face a tax increase of 2% to 6%, depending on the difference between what the CEO is paid and the pay of their average worker (https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200SB37). As of January 2020, an amended version of the bill, applying only to companies with earnings more than $10 million, would tax companies based on the gap between the highest and lowest paid employees. California corporations would face a tax increase from 10.84% to as much as 14.84%, while California-domiciled financial institutions are looking at a possible increase from 12.82% to 16.84%. Read more in the *Sacramento Bee*, January 17, 2020 (https://www.sacbee.com/opinion/california-forum/article239287588.html#storylink=cpy) and the *California Globe*, February 24, 2020 (https://californiaglobe.com/section-2/california-businesses-could-face-higher-taxes-based-on-gap-between-highest-and-lowest-wages/).

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Figure 1. Large State Personal Income Tax Rate Shocks Over Time

This figure shows the yearly number of large increases and decreases in state-level personal income tax rates between 1992 and 2022, where the large changes are those exceeding one percentage point for earners in the top tax bracket. The blue (orange) bars are for increases (decreases) in tax rates.

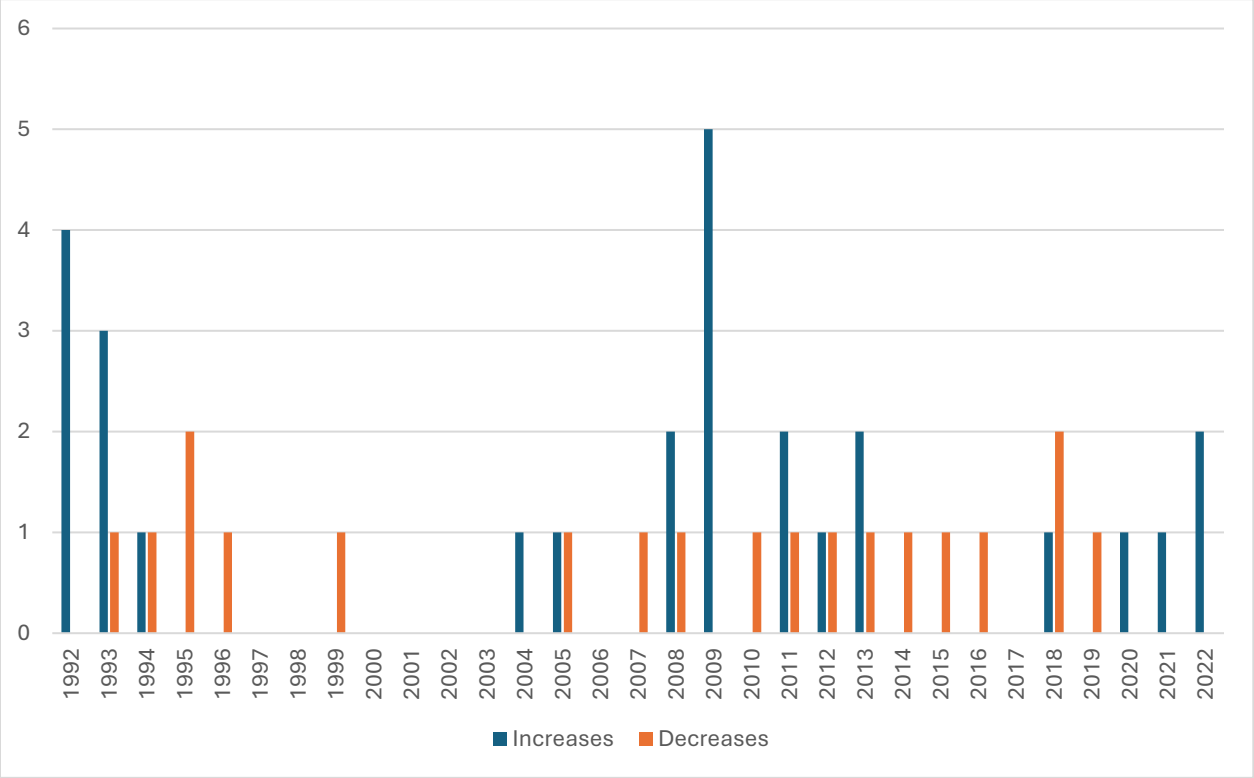
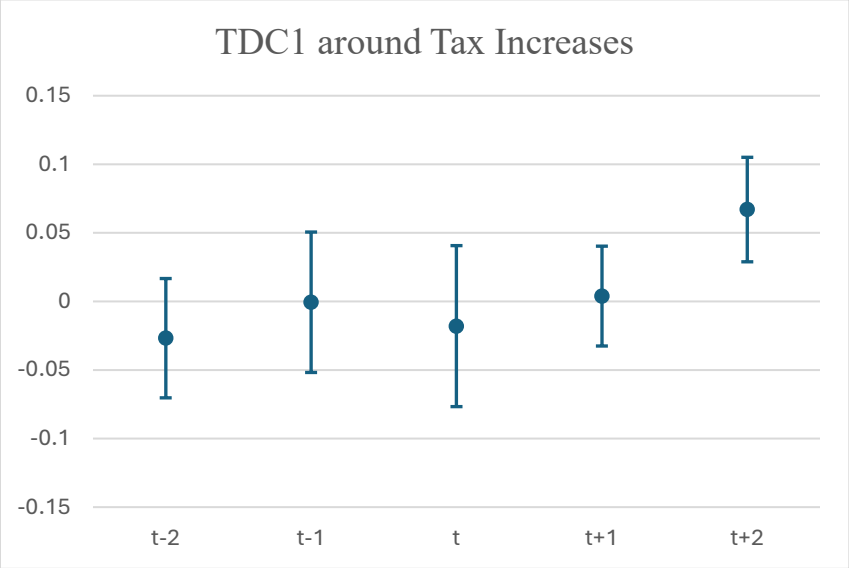


Figure 2. Differences in CEO Pay Changes Between Treated and Control Groups in Years Around Tax Changes

This figure shows the differences in CEO pay changes between the treated group and control group around tax changes. The treated group includes CEOs in firms headquartered in states experiencing large personal income tax rate changes (greater than one percentage point). The control group includes CEOs in firms headquartered in states without personal income tax changes. Panel A (B) is for tax increases (decreases). The x-axis shows the year relative to an event year (as year t). The y-axis shows the difference in CEO pay changes [Δln(TDC1), to be used as the dependent variable in DiD analysis]. The blue dots represent the average yearly differences in Δln(TDC1) between treated and control groups. The bars show the 90% confidence intervals.

Panel A. Tax increases



Panel B. Tax decreases

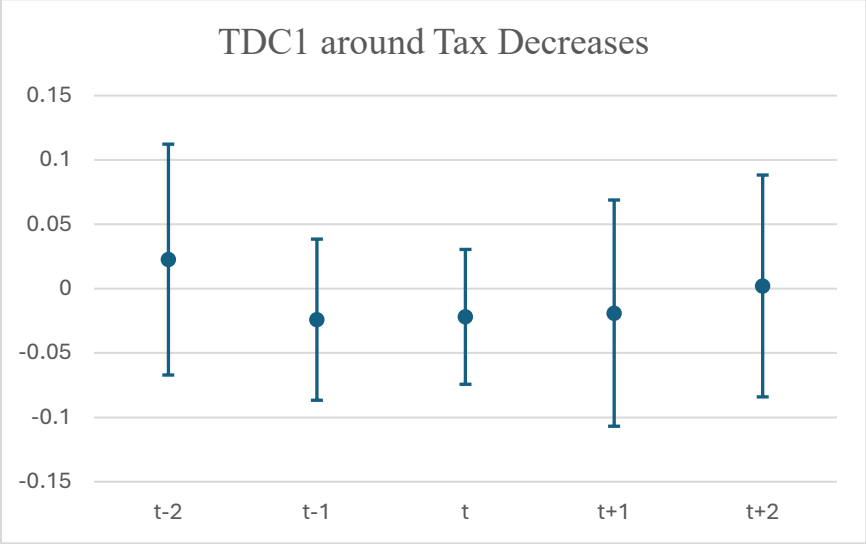


Figure 3. Components of CEO Compensation

This figure illustrates the yearly average of the value of the components of CEO compensation between 1992 and 2022 inclusive. The components include salary, bonus, non-equity incentives, stock, and options in thousands of US$. The data are from Execucomp.

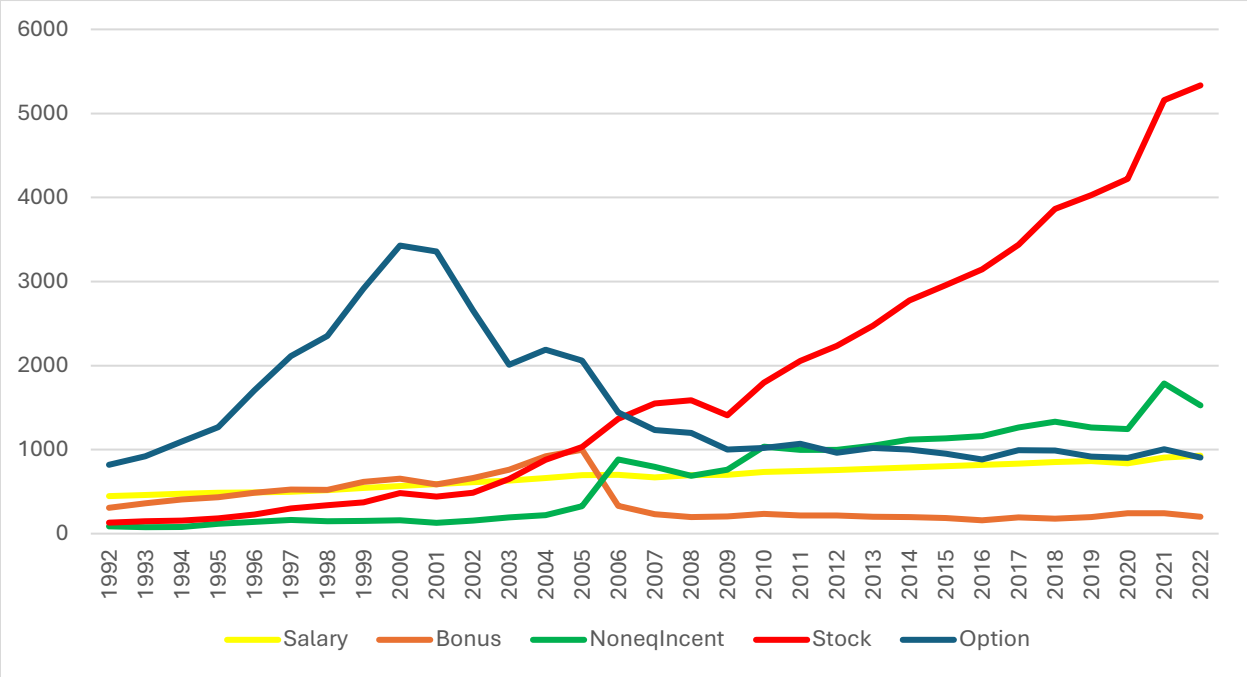


Figure 4. Examples for Neighbor States Without Tax Shocks

This figure shows examples for neighboring control states for treated states with tax increases or increases. For example, North Dakota (ND) had a tax increase [in Red]; Montana (MT) and South Dakota (SD) are neighbors without shocks [in Yellow]; Minnesota (MN) had a tax increase, so is not designated as a neighbor control state. In our sample, in total we have 15 (14) unique states with large tax increases (decreases) and correspondingly have 20 (21) unique neighboring control states without tax shocks.

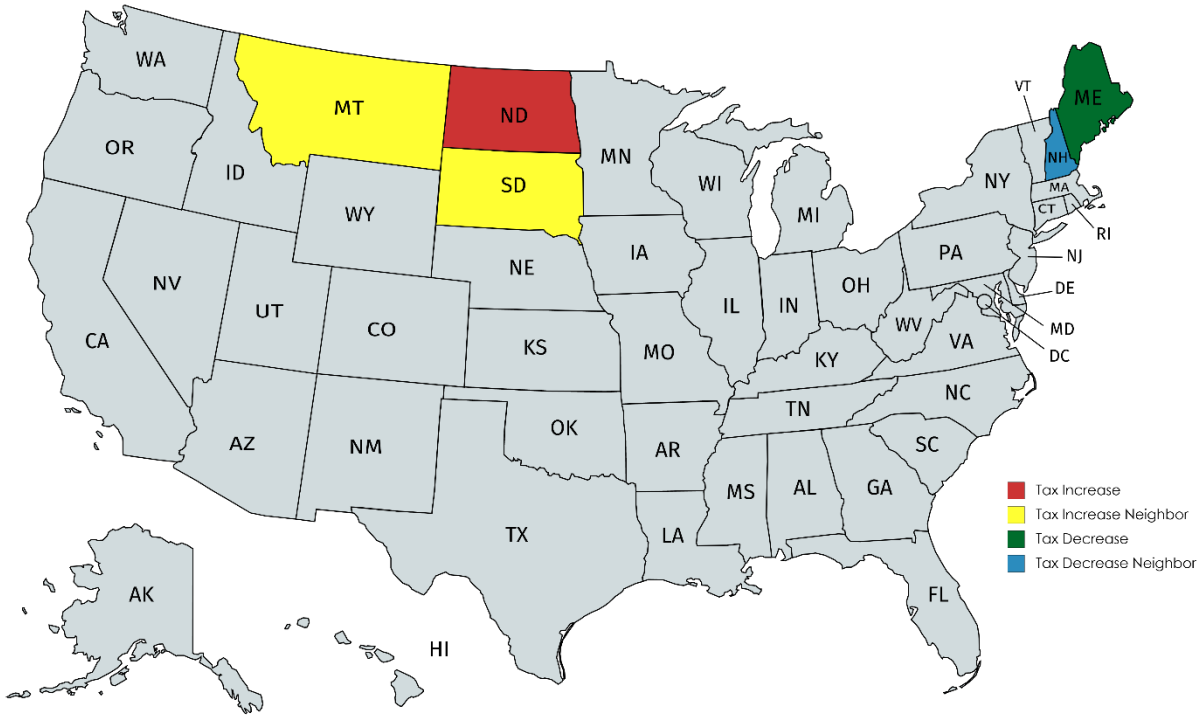


Table 1. Summary Statistics

This table presents summary statistics for US data for state tax shocks (Panels A and B) and international data on federal tax shocks (Panel C). Panel A displays changes in the top state personal income tax rate. Panel B provides summary statistics for the US at the level of CEO-firm-year on compensation, personal income tax rate changes and firm characteristics. The US sample consists of firms in the intersection of Execucomp and Compustat for the years 1992 – 2022 inclusive. The compensation-related variables are in thousands of US dollars. Assets are in millions of dollars. The international data sample is based on federal tax shocks for 21 countries (including US) for the years 2011– 2022 (Panel C). Variables (except dummy variables) are winsorized at the 1st and 99th percentile values. Variable definitions are in Appendix 1.

Panel A: Top State Personal Income Tax Rate Changes

	Mean% | Count		
	Increase	Decrease	Both
Large	1.95% | 27	-1.60% | 19	NA | 46
Small	0.22% | 89	-0.22% | 236	NA | 325
Total	0.62% | 116	-0.32% | 255	NA | 371

Panel B: CEO-Firm-Year Summary Statistics, US Sample

Variable	Mean	SD	p25	p50	p75	N
CEO-Firm-Year						
Large State Tax Increase (0, 1)	0.026	0.160	0	0	0	22,291
Large State Tax Decrease (0, 1)	0.013	0.114	0	0	0	22,291
Small State Tax Increase (0, 1)	0.051	0.219	0	0	0	22,291
Small State Tax Decrease (0, 1)	0.135	0.342	0	0	0	22,291
Total Pay (TDC1) ($1,000s)	5,879	6,070	1,836	3,925	7,611	22,291
Salary ($1,000s)	769	357	501	725	990	22,291
Bonus ($1,000s)	335	732	0	0	374	22,291
Noneq Incentives ($1,000s)	837	1,363	0	198	1,162	22,291
Stock Pay ($1,000s)	1,971	3,155	0	558	2,673	22,291
Option Pay ($1,000s)	1,609	3,004	0	540	1,838	22,291
Perquisites ($1,000s)	237	665	13	52	180	22,291
Firm-Year						
Assets ($1,000,000s)	6,489	19,635	552	1,477	4,531	22,291
MTB	2.189	1.468	1.279	1.711	2.536	22,291
ROA	0.047	0.104	0.021	0.057	0.095	22,291

Panel C: CEO-Firm-Year Summary Statistics, International Sample

Variable	Mean	SD	p25	p50	p75	N
CEO-Firm-Year						
Large State Tax Increase (0, 1)	0.080	0.271	0	0	0	6,884
Large State Tax Decrease (0, 1)	0.077	0.267	0	0	0	6,884
Total Pay (TDC1) ($1,000s)	5,953	3,919	2,874	5,185	8,373	6,884
Salary ($1,000s)	878	368	630	862	1,056	6,883
Bonus ($1,000s)	98	395	0	0	0	6,368
Noneq Incentives ($1,000s)	1,152	1,248	235	840	1,657	6,360
Stock Pay ($1,000s)	2,831	2,742	687	2,035	4,218	6,360
Option Pay ($1,000s)	788	1,313	0	0	1179	6,360
Perquisites ($1,000s)	227	610	18	61	186	6,360
Firm-Year						
Assets ($1,000,000s)	9,807	29,152	824	2335	7,353	6,884
MTB	2.144	1.515	1.242	1.657	2.454	6,884
ROA	0.045	0.098	0.017	0.051	0.088	6,884

Table 2. Elasticity of US CEO Compensation in the US State Net-of-Tax Rate

This table shows the elasticity of US CEO compensation in the net-of-personal-income-tax rate. The dependent variable is transformed CEO total compensation, Δln(TDC1), control variables include Assets, MTB, and ROA. Δ denotes difference, Ln(.) is the natural logarithm, and NOT_t is the after-tax multiple for pay $(1-\tau_{m,f,t}-\tau_{m,s,t})$ for CEO m in year t (f (s) denotes federal (state)). In Column 3 the calculation of NOT_t considers all tax changes of any size. In Columns 1 and 2 we consider large tax rate increases only (at least one percentage point) and so set $NOT_{t-s}/NOT_{t-(s-1)} = 1$ for all CEO-year observations when the tax rate change is less than one percentage point. All specifications include CEO-Firm and Industry-Year fixed effects. Robust standard errors are clustered at the state level. Appendix 1 provides variable definitions. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. Federal changes included in NOT are washed out by year FEs.

	(1)	(2)	(3)
	Large (≥1%) State Tax Changes		All State Tax Changes
Dependent Variable	ΔLn(TDC1)		ΔLn(TDC1)
Ln(NOT_{t-2}/ NOT_{t-1})	0.041	0.096	0.315
	[0.08]	[0.20]	[0.75]
Ln(NOT_{t-3}/ NOT_{t-2})	0.906**	0.730**	0.405
	[2.30]	[2.01]	[1.20]
ΔLn(Assets$_{t-1}$)		0.327***	0.327***
		[12.42]	[12.41]
ΔMTB$_{t-1}$		0.074***	0.074***
		[9.55]	[9.57]
ΔROA$_{t-1}$		0.393***	0.393***
		[5.87]	[5.87]
Observations	22,575	22,291	22,291
R-squared	0.177	0.196	0.196
CEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Table 3. Elasticity of CEO Compensation in the *Federal* Tax Rate

This table shows the elasticity of CEO compensation in the net-of-personal-income-tax rate. The dependent variable is transformed CEO total compensation, Δln(TDC1), control variables include Assets, MTB, and ROA, , Δ denotes difference, Ln(.) is the natural logarithm, and NOT_t is the after-tax multiple for pay $(1-\tau_{m,f,t}-\tau_{m,s,t})$ for CEO m in year t (f (s) denotes federal (state)). In the left panel, state tax changes are not excluded from the inverse NOT calculations. In the right panel, state tax changes are removed by setting the state tax rate equal to the state top income tax rate in the prior year. Robust standard errors are clustered at the state level. Appendix 1 provides variable definitions. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Inverse Net-of-Tax Rate Includes State Tax Changes				State Tax Rate Held Constant in Inverse Net-of-Tax Rate in Adjacent Years			
Dep. Variable	ΔLn(S&B)		ΔLn(TDC1)		ΔLn(S&B)		ΔLn(TDC1)	
Ln(NOT_{t-2}/ NOT_{t-1})	0.072	0.044	0.274**	0.272**	0.128*	0.093	0.298**	0.296**
	[1.05]	[0.64]	[2.49]	[2.47]	[1.68]	[1.22]	[2.44]	[2.42]
Ln(NOT_{t-3}/ NOT_{t-2})	0.067	0.041	0.046	0.045	0.097	0.064	0.036	0.033
	[0.97]	[0.59]	[0.42]	[0.41]	[1.27]	[0.83]	-0.29]	[0.27]
Ln(Initial Pay)		-0.018***		-0.001		-0.018***		-0.001
		[-7.39]		[-0.36]		[-7.35]		[-0.36]
ΔLn(Assets$_{t-1}$)	0.210***	0.198***	0.375***	0.374***	0.210***	0.198***	0.375***	0.374***
	[14.10]	[13.19]	[16.84]	[16.67]	[14.10]	[13.19]	[16.84]	[16.66]
ΔMTB$_{t-1}$	0.045***	0.045***	0.073***	0.073***	0.045***	0.045***	0.073***	0.073***
	[11.59]	[11.55]	[11.89]	[11.89]	[11.60]	[11.57]	[11.90]	[11.90]
ΔROA$_{t-1}$	0.388***	0.394***	0.425***	0.425***	0.388***	0.394***	0.426***	0.425***
	[11.20]	[11.37]	[8.75]	[8.74]	[11.20]	[11.37]	[8.75]	[8.74]
Observations	23,311	23,309	23,384	23,382	23,311	23,309	23,384	23,382
R-squared	0.030	0.033	0.035	0.035	0.030	0.033	0.035	0.035

Table 4. CEO Compensation Responsiveness to State Personal Income Tax Changes (DiD)

This table shows the effects of changes in personal US state income tax rates on CEO compensation. *Tax Increase* (*Decrease*) is a dummy variable that equals one if a CEO's state personal income tax rate increases (decreases) by at least one percentage point in a year and zero otherwise. Total pay is TDC1 in Execucomp database. The dependent variable is Δln(TDC1) and the control variables are transformed Assets, MTB, and ROA, Δ denotes difference, and Ln(.) is the natural logarithm. All specifications include CEO-Firm and Industry-Year fixed effects. Robust standard errors are clustered at the state level. Variables are defined in Appendix 1. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	Base Control Sample			Spotless Control Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variable	ΔLn(TDC1)			ΔLn(TDC1)		
$Tax\ Increase_{t-1}$	0.008		0.008	0.013		0.012
	[0.41]		[0.41]	[0.61]		[0.60]
$Tax\ Increase_{t-2}$	0.064***		0.066***	0.072***		0.074***
	[3.75]		[3.89]	[4.76]		[5.13]
$Tax\ Decrease_{t-1}$		-0.011	-0.014		-0.013	-0.016
		[-0.32]	[-0.43]		[-0.28]	[-0.37]
$Tax\ Decrease_{t-2}$		0.016	0.021		0.013	0.020
		[0.44]	[0.58]		[0.31]	[0.47]
$\Delta Ln(Assets_{t-1})$	0.328***	0.327***	0.328***	0.336***	0.335***	0.336***
	[12.35]	[12.34]	[12.29]	[10.63]	[10.55]	[10.54]
ΔMTB_{t-1}	0.074***	0.074***	0.074***	0.072***	0.072***	0.072***
	[9.61]	[9.55]	[9.59]	[8.58]	[8.52]	[8.53]
ΔROA_{t-1}	0.392***	0.394***	0.392***	0.303***	0.304***	0.303***
	[5.88]	[5.88]	[5.89]	[5.37]	[5.38]	[5.39]
Observations	22,291	22,291	22,291	15,563	15,563	15,563
R-squared	0.196	0.196	0.196	0.212	0.212	0.212
CEO-Firm FE	Y	Y	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y	Y	Y

Table 5. NEO (Non-CEO) Compensation Responsiveness to Personal Income Tax Changes

This table shows the effects of changes in US state personal income tax rates on non-CEO named executive officer (NEO) total compensation. *Tax Increase* (*Decrease*) is a dummy variable that equals one if an NEO's state personal income tax rate increases (decreases) by at least one percentage point in a year and zero otherwise. Total pay is TDC1 in Execucomp. The dependent variable is Δln(TDC1), the control variables are transformations of Assets, MTB, and ROA, Δ denotes difference, and Ln(.) is the natural logarithm. All specifications include NEO-Firm and Industry-Year fixed effects. Robust standard errors are clustered at the state level. Variables are defined in Appendix 1. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) ΔLn(TDC1)	(2) ΔLn(TDC1)	(3) ΔLn(TDC1)
Tax Increase$_{t-1}$	-0.023		-0.022
	[-1.16]		[-1.07]
Tax Increase$_{t-2}$	0.024		0.025*
	[1.52]		[1.73]
Tax Decrease$_{t-1}$		0.003	-0.001
		[0.08]	[-0.03]
Tax Decrease$_{t-2}$		0.032	0.032
		[0.67]	[0.69]
ΔLn(Assets$_{t-1}$)	0.250***	0.250***	0.250***
	[11.51]	[11.40]	[11.38]
ΔMTB$_{t-1}$	0.063***	0.063***	0.063***
	[8.69]	[8.73]	[8.72]
ΔROA$_{t-1}$	0.335***	0.336***	0.335***
	[3.79]	[3.81]	[3.79]
Observations	75,934	75,934	75,934
R-squared	0.212	0.212	0.212
NEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Table 6. CEO Compensation Components and Large State Personal Income Tax Changes

This table shows the effects of changes in US state personal income tax rates on the components of CEO compensation. *Tax Increase* (*Decrease*) is a dummy variable that equals one if a CEO's state personal income tax rate increases (decreases) by at least one percentage point in a year and zero otherwise. The dependent variable is the change in the logarithm of the component of CEO compensation. The control variables are transformed Assets, MTB, and ROA, where Δ denotes difference, and Ln(.) is the natural logarithm. All specifications include CEO-Firm and Industry-Year fixed effects. Robust standard errors are clustered at the state level. Variables are defined in Appendix 1. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Base Control Sample

	(1)	(2)	(3)	(4)	(5)
VARIABLES	ΔLn(Salary)	ΔLn(Bonus)	ΔLn(NonEq Incent)	ΔLn(Stock)	ΔLn(Option)
Tax Increase$_{t-1}$	-0.008	-0.064	0.017	-0.035	-0.049
	[-0.71]	[-0.63]	[0.40]	[-0.74]	[-1.37]
Tax Increase$_{t-2}$	-0.012	0.014	0.109***	0.066**	0.008
	[-0.76]	[0.20]	[2.88]	[2.35]	[0.20]
ΔLn(Assets$_{t-1}$)	0.027*	0.360***	0.315***	0.182***	0.386***
	[2.00]	[6.16]	[6.75]	[5.06]	[8.57]
ΔMTB$_{t-1}$	0.002	0.135***	0.179***	0.028	0.045***
	[1.33]	[8.16]	[6.35]	[1.59]	[4.32]
ΔROA$_{t-1}$	0.073***	1.445***	1.060***	0.173	0.175***
	[3.07]	[7.51]	[7.45]	[1.56]	[2.86]
Observations	22,201	7,473	9,745	11,469	12,453
R-squared	0.315	0.343	0.303	0.247	0.279
CEO-Firm FE	Y	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y	Y

Panel B: Spotless Control Sample

	(1)	(2)	(3)	(4)	(5)
VARIABLES	ΔLn(Salary)	ΔLn(Bonus)	ΔLn(NonEq Incent)	ΔLn(Stock)	ΔLn(Option)
Tax Increase$_{t-1}$	-0.009	-0.147	0.013	-0.015	-0.067*
	[-0.75]	[-1.46]	[0.32]	[-0.34]	[-1.78]
Tax Increase$_{t-2}$	-0.012	-0.029	0.122***	0.060**	0.033
	[-0.70]	[-0.54]	[3.76]	[2.18]	[0.98]
ΔLn(Assets$_{t-1}$)	0.016	0.311***	0.326***	0.207***	0.408***
	[1.00]	[3.41]	[6.30]	[4.38]	[8.83]
ΔMTB$_{t-1}$	0.001	0.138***	0.168***	0.035	0.037***
	[0.87]	[7.43]	[5.91]	[1.57]	[3.16]
ΔROA$_{t-1}$	0.087***	1.442***	0.831***	0.218	0.131**
	[2.94]	[6.35]	[6.66]	[1.69]	[2.33]
Observations	15,477	5,123	6,690	7,796	8,803
R-squared	0.320	0.373	0.305	0.264	0.291
CEO-Firm FE	Y	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y	Y

Table 7. Do CEO Pay Changes Precede State Personal Income Tax Rate Changes

This table shows the relationship between US state personal income tax rate changes and CEO pay changes. Tax Increase (Decrease) is a dummy variable, which equals one if a state experiences an increase (decrease) in personal income tax rate greater than one percentage point in a year and zero otherwise. The CEO pay growth (ΔCEO pay) is the average change in firm-level CEO pay within a state-year. The test sample is at the state-year level. We use the linear probability model. State-level controls include transformed debt, state GDP, tax revenues, cash savings, population, democrat government indicator, and unemployment rate. Δ denotes the first difference. All specifications include state fixed effects and year fixed effects. State financial data is from the Urban Institute. The sample period is 1997 to 2021. Robust standard errors are clustered at the state level. Appendix 1 provides variable definitions. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
VARIABLES	Tax Increase	Tax Decrease
ΔCEO pay$_{t-1}$	0.024	-0.019
	[1.36]	[-1.17]
ΔCEO pay$_{t-2}$	-0.008	-0.031
	[-0.73]	[-1.63]
ΔLn(State GDP$_{t-1}$)	0.188	-0.096
	[1.22]	[-0.83]
ΔLn(Population$_{t-1}$)	0.003	-0.201
	[0.01]	[-0.58]
ΔDemocrat Gov$_{t-1}$	0.014	-0.028*
	[1.03]	[-1.71]
ΔUnemployment$_{t-1}$	0.003	-0.050
	[0.10]	[-1.38]
ΔLn(SDebt$_{t-1}$)	0.025	0.056
	[0.52]	[1.31]
ΔLn(Tax Revenue$_{t-1}$)	-0.088	0.015
	[-1.64]	[0.77]
ΔLn(SCash$_{t-1}$)	-0.031	0.022
	[-1.36]	[0.77]
Observations	1,129	1,129
R-squared	0.114	0.066
State FE	Y	Y
Year FE	Y	Y

Table 8. CEO Pay and Exogenous State Tax Shocks: A Narrative Approach

This table shows the effects of changes in personal income tax rates on CEO compensation and only exogenous tax shocks are included in the test sample. *Tax Increase* (*Decrease*) is a dummy variable that equals one if a CEO's state personal income tax rate increases (decreases) by at least one percentage point in a year and zero otherwise. Total pay is TDC1 in Execucomp database. The dependent variable is Δln(TDC1) or a transformed component of CEO compensation, the control variables are transformed Assets, MTB, and ROA, Δ denotes difference, and Ln(.) is the natural logarithm. All specifications include CEO-Firm and Industry-Year fixed effects. Exogenous tax changes are identified by a narrative approach following Romer and Romer (2010) and Giroud and Rauh (2019). Specifically, 38 (out of 46) large tax changes in our sample are identified as exogenous tax changes. Robust standard errors are clustered at the state level. Variables are defined in Appendix 1. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	Base Control Sample			Spotless Control Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variable	ΔLn(TDC1)			ΔLn(TDC1)		
$Tax\ Increase_{t-1}$	0.012		0.012	0.017		0.016
	[0.72]		[0.71]	[0.84]		[0.80]
$Tax\ Increase_{t-2}$	0.068***		0.069***	0.081***		0.083***
	[3.94]		[4.15]	[5.21]		[5.80]
$Tax\ Decrease_{t-1}$		-0.006	-0.008		-0.012	-0.014
		[-0.16]	[-0.24]		[-0.25]	[-0.32]
$Tax\ Decrease_{t-2}$		0.018	0.024		0.016	0.025
		[0.48]	[0.65]		[0.38]	[0.58]
$\Delta Ln(Assets_{t-1})$	0.325***	0.327***	0.326***	0.333***	0.335***	0.333***
	[12.29]	[12.37]	[12.27]	[10.48]	[10.55]	[10.39]
ΔMTB_{t-1}	0.074***	0.074***	0.074***	0.072***	0.072***	0.072***
	[9.63]	[9.52]	[9.58]	[8.63]	[8.52]	[8.58]
ΔROA_{t-1}	0.393***	0.394***	0.394***	0.304***	0.304***	0.304***
	[5.92]	[5.87]	[5.92]	[5.49]	[5.36]	[5.48]
Observations	22,228	22,275	22,212	15,498	15,558	15,493
R-squared	0.196	0.196	0.196	0.212	0.212	0.212
CEO-Firm FE	Y	Y	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y	Y	Y

Table 9. CEO Pay and Exogenous State Tax Shocks: Neighboring Control States

This table shows the effects of changes in US state personal income tax rates on CEO compensation using neighboring control states. *Tax Increase* (*Decrease*) is a dummy variable that equals one if a CEO's state personal income tax rate increases (decreases) by at least one percentage point in a year and zero otherwise. The left (right) panel reports the results using the base (spotless) control sample. Column 1 (4) includes tax-increase treated states and neighboring control states (that have never had a tax rate change). Column 2 (5) includes tax-decrease treated states and neighboring control states (that have never had a tax rate change). Column 3 (6) includes tax-increase treated states, tax-decrease treated states and neighboring control states to both tax-increase and tax-decrease states (that have never had a tax rate change). Total pay is TDC1 in Execucomp database. The dependent variable is Δln(TDC1). The control variables are transformed Assets, MTB, and ROA, Δ denotes difference, and Ln(.) is the natural logarithm. All specifications include CEO-Firm and Industry-Year fixed effects. Robust standard errors are clustered at the state level. Variables are defined in Appendix 1. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	Base Control Sample			Spotless Control Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variable	ΔLn(TDC1)	ΔLn(TDC1)	ΔLn(TDC1)	ΔLn(TDC1)	ΔLn(TDC1)	ΔLn(TDC1)
Tax Increase$_{t-1}$	0.006		0.004	0.009		0.008
	[0.31]		[0.20]	[0.44]		[0.40]
Tax Increase$_{t-2}$	0.069***		0.064***	0.072***		0.073***
	[4.26]		[3.91]	[5.15]		[5.34]
Tax Decrease$_{t-1}$		-0.006	-0.008		-0.011	-0.014
		[-0.17]	[-0.26]		[-0.24]	[-0.33]
Tax Decrease$_{t-2}$		0.009	0.016		0.006	0.013
		[0.26]	[0.47]		[0.16]	[0.34]
ΔLn(Assets$_{t-1}$)	0.306***	0.317***	0.315***	0.320***	0.320***	0.321***
	[10.41]	[12.22]	[11.80]	[9.84]	[9.82]	[9.83]
ΔMTB$_{t-1}$	0.072***	0.073***	0.073***	0.071***	0.071***	0.071***
	[8.35]	[9.05]	[9.18]	[8.29]	[8.28]	[8.29]
ΔROA$_{t-1}$	0.316***	0.353***	0.355***	0.291***	0.293***	0.292***
	[5.85]	[5.81]	[5.87]	[4.97]	[4.99]	[4.99]
Observations	17,827	20,403	20,598	14,696	14,735	14,735
R-squared	0.207	0.202	0.201	0.215	0.215	0.215
CEO-Firm FE	Y	Y	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y	Y	Y

Table 10. Distance to State Border, Tax Increases, and CEO Compensation

This table shows the effects of changes in personal income tax rates on CEO total compensation. *Tax Increase* is a dummy variable that equals one if an CEO's state personal income tax rate increases by at least one percentage point in a year and zero otherwise. *Miles to nearest state border* is the number of miles from a firm's address to its nearest neighbor state border. Total pay is TDC1 in Execucomp. The dependent variable is Δln(TDC1). The control variables are transformed Assets, MTB, and ROA, Δ denotes difference, and Ln(.) is the natural logarithm. All specifications include CEO-Firm and Industry-Year fixed effects. Robust standard errors are clustered at the state level. Variables are defined in Appendix 1. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	Base Control Sample	Spotless Control Sample
	(1)	(2)
Dep. Variable	ΔLn(TDC1)	ΔLn(TDC1)
Tax Increase$_{t-1}$	0.013	0.022
	[0.65]	[0.96]
Tax Increase$_{t-2}$	0.062**	0.068**
	[2.00]	[2.31]
Tax Increase$_{t-2}$ × Miles to nearest border state	0.000	0.000
	[0.16]	[0.31]
ΔLn(Assets$_{t-1}$)	0.322***	0.329***
	[12.71]	[11.04]
ΔMTB$_{t-1}$	0.072***	0.069***
	[7.45]	[6.42]
ΔROA$_{t-1}$	0.370***	0.282***
	[5.35]	[4.83]
Observations	20,776	14,519
R-squared	0.198	0.214
CEO-Firm FE	Y	Y
Industry-Year FE	Y	Y

Table 11. CEO Compensation and *International Federal* Personal Income Tax Changes (DiD)

This table shows the effects of changes in federal personal income tax rates on CEO compensation. *Tax Increase* (*Decrease*) is a dummy variable that equals one if a CEO's federal personal income tax rate increases (decreases) by at least one percentage point in a year and zero otherwise. The dependent variable is ΔLn(TDC1) or a transformed component of CEO compensation, the control variables are transformed Assets, MTB, and ROA, Δ denotes difference, and Ln(.) is the natural logarithm. All specifications include CEO-Firm and Industry-Year fixed effects. Robust standard errors are clustered at the state level. Variables are defined in Appendix 1. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) ΔLn(TDC1)	(2) ΔLn(TDC1)	(3) ΔLn(TDC1)
Tax Increase$_{t-1}$	0.065*		0.066*
	[1.83]		[1.85]
Tax Increase$_{t-2}$	0.067**		0.067**
	[2.31]		[2.43]
Tax Decrease$_{t-1}$		0.010	0.017
		[0.23]	[0.43]
Tax Decrease$_{t-2}$		-0.037	-0.031
		[-1.68]	[-1.42]
ΔLn(Assets$_{t-1}$)	0.204***	0.205***	0.204***
	[14.41]	[13.88]	[14.53]
ΔMTB$_{t-1}$	0.053***	0.052***	0.052***
	[35.36]	[33.09]	[33.85]
ΔROA$_{t-1}$	0.256***	0.257***	0.254***
	[19.90]	[19.70]	[20.12]
Observations	10,303	10,303	10,303
R-squared	0.203	0.203	0.203
NEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Appendix 1: Variable Definitions

Assets	total book value of assets
Bonus	CEO discretionary bonus
Democrat Gov	dummy variable equal to one if the state had a democratic governor in a particular year, zero otherwise
Log(Assets)	the natural logarithm of total book assets
MTB	the market value of equity (shares outstanding multiplied by share price) divided by the book value of shareholder's equity
NonEqIncent	value of a CEO's cash performance pay in a given year
NOT	$NOT_t \equiv (1 - \tau_{f,t} - \tau_{s,t})$ means "net of tax", where $\tau_{f,t}$ ($\tau_{s,t}$) is the top marginal federal (state) tax rate at time *t*
Options	value of a CEO's options awards in a given year
Pay Raise	the pay raise dummy that equals one if the CEO received a pay raise within two years of the tax rate change and zero otherwise
Population	the total state population within a specific year
ROA	net income scaled by total assets
SCash	the total cash of a given state in a specific year
SDebt	the total debt of a given state in a specific year
State GDP	the gross domestic product within a state-year
Stock	value of a CEO's stock awards in a given year
Tax Increase	a dummy variable equal to one if a CEO experienced a personal income tax rate increase (greater than one percentage point, and zero otherwise

Tax Decrease	a dummy variable equal to one if a CEO experienced a personal income tax rate decrease (greater than one percentage point), and zero otherwise
Tax Revenue	total tax revenue within a state-year
TDC1	total CEO compensation in a given year
Unemployment	the percentage of workers that are unemployed within a state-year

Appendix 2: Supplemental Figures and Tables

Figure S1. The First-difference Setting of the DiD Analysis

This figure illustrates the correspondence of the level of treatment dummy and the first difference in the treatment dummy. The upper (lower) panel shows the event study based on a single (two) event(s) as indicated by the red cross(es) on the time axis. *Treatment* is the treatment dummy (counter) variable that equals one (the number of treatments) after the corresponding shock(s). *ΔTreatment* is the first difference in *Treatment* and indicates an appearance of a new shock.

