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How Executive Compensation Changes In Response To Personal Income Tax Shocks

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Abstract

We examine how executive compensation responds to personal income tax shocks using changes in U.S. state tax rates from 1992 to 2022. CEO pay increases by 6.4% to 7.4% two years after a large state tax increase but does not decline following a state tax cut. Estimates based on changes in netof-tax rates imply that firms absorb most of the additional tax burden and that the supply of CEO services is substantially more elastic than firm demand. The pay response is stronger when CEOs have more outside employment opportunities and are less attached to the firm, but not when corporate governance is weaker. The evidence supports a competitive labor-market mechanism rather than governance-based rent extraction and indicates that the incidence of state personal income taxes falls largely on firms.

Keywords: Executive compensation; Personal income tax; Elasticity of CEO supply curve

JEL Classification: G3, H24, H71, J33, M12

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How Executive Compensation Changes In Response to Personal Income Tax Shocks

1. Introduction

The level and structure of executive pay are complex, controversial concerns (Bettis et al., 2018; Coles et al., 2024; Albuquerque et al., 2025). Persistent interest among investors, regulators, politicians, and executives has spawned a substantial scholarly literature as well as a considerable compensation consulting industry. Each addresses the determinants and consequences, economic and otherwise, of the level and incentive properties of executive pay.

Edmans, Gabaix, and Jenter (2017), in their survey of the theories and empirical evidence on managerial compensation, note that 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 approach. While interesting in itself, we do so in large part as an empirical means to examine the other two. We use state income tax shocks to distinguish competitive labor-market forces from agency-based explanations of pay formation in the executive labor market.

Several prior studies that examine income taxes and executive compensation report negligible effects of US *federal* income tax policy on managerial pay (Goolsbee, 2000; Hall and Liebman, 2000; Rose and Wolfram, 2002). 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 in executive pay…". Given the finding that federal income tax shocks have negligible effects, a plausible initial

view is that there would be no change in executive pay in response to a change in personal state income tax. We argue instead that *state* tax rate changes are fundamentally different.

The top federal income tax rate and shocks to that rate apply uniformly to all U.S. executives across all states. Consequently, the employment options that would avoid a US federal personal income tax increase would require relocation to another country, not just another state, with a lower personal income tax rate. In contrast, differences across states in rates can be substantial. For example, in 2020 California's top marginal personal income tax rate was 13.3 percent, as compared to no state personal income tax in Texas, Florida, Nevada and several other states.[1] Accordingly, the threat by an executive of relocating to another US state with a lower state personal income tax rate is likely to be credible. Along these lines, it appears that US executives are attuned to such differences in state tax rates and will threaten to relocate or actually will relocate.[2]

We reject the null hypothesis of no effect of state income tax on CEO pay. Our empirical analysis indicates that the response of CEO compensation to state personal income tax *increases* is economically and statistically significant. The size of the pay increase depends on supply and demand considerations, such as outside employment opportunities for CEOs. Furthermore, the effect is asymmetric. Specifically, tax increases lead to compensation increases, while tax *decreases* have no effect on pay for CEOs.

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[1] Figure A1 (Appendix 2) provides additional specifics for all US states.

[2] We thank Carola Frydman and Wayne Guay for bringing locational concerns to our attention. See https://www.bizjournals.com/sanfrancisco/news/2020/11/17/california-exodus-roared-on-even-before-covid-hit.html and https://www.wsj.com/tech/elon-musk-to-discuss-teslas-banner-year-despite-pandemic-silicon-valleys-future-11607449988. Moreover, top athletes in team sports have limited locational flexibility but are acutely aware of how income tax rates vary across jurisdictions. For 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). Likewise, Kleven, Landais, and Saez (2013) report evidence of strong mobility responses by superstar European football players across national borders to national tax rates. Finally, Moretti and Wilson (2017) find that the levels of US state income tax rates have a significant effect on the geographical location of superstar scientists in the US. Our analysis addresses related questions for "star" managers, specifically top executives in US firms.

To frame our analysis, 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 several reasons why a change in personal income tax rate would affect executive pay. First, higher income taxes can directly reduce executives' after-tax income, thereby shifting the supply curve for executive input inward, which implies 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 demand 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, as intimated above, the location and shape of the supply curve will depend on the existence and extent of external opportunities the CEO has for CEO positions at employers offering higher pay or in alternative low-tax domiciles, and on the frictions, benefits, and costs to the CEO of switching.[3]

Second, in the matching model some will prefer to understand the determination of pay in the transaction cost economics (TCE) framework. Again, think of firm and executive "endowments" matched based on the potential reciprocal synergies arising from the characteristics and capabilities of the firm and manager. This bilateral dependency can create a one- or two-sided holdup problem.[4] Therein specific firm assets and a particular manager's specific human capital

[3] More generally, migration associated with tax differentials or changes in tax differentials does occur. Estimates of lost (gained) tax revenue over the last decade (2011-2021) due to interstate migration away from high-tax or to low-tax states include the following: New York lost $111 billion in AGI; California lost $102 billion; Illinois lost $63 billion; Florida gained $196 billion; and Texas gained $54 billion. See https://www.ntu.org/foundation/detail/florida-continues-to-attract-new-residents-new-york-california-and-illinois-lose-the-most-population.

[4] In a related approach, Barry (2025) estimates a structural model of the managerial labor market with general and firm-specific human capital accumulation, bargaining power, and imperfect competition.

cannot generate surplus without the other, so that bargaining power in the hold-up problem can be ascribed to the firm or manager or both (Hart and Moore, 1990).

Third, we consider governance-based rent extraction as an alternative to the labor-market mechanism. Even under optimally designed contracts, informational and other frictions can generate second-best outcomes (Holmstrom, 1979) and residual agency losses (Jensen and Meckling, 1976). These frictions may allow executives to influence compensation beyond the level implied by competitive labor-market forces, particularly when internal governance or external monitoring is weak. We therefore examine whether the compensation response to state personal income tax increases is stronger among firms with weaker governance. Our evidence does not support governance-related rent extraction as an important explanation for our findings and instead points to labor-market forces as the primary mechanism.

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 (Figure 1). This approach is consistent with the likelihood that large tax changes are more salient than small ones and that the 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 assess the effect of state personal income tax changes on pay. First, we apply a difference-in-differences (DiD) approach to state personal income tax shocks. Second, following the prior literature on federal income tax changes (e.g., Frydman and Molloy, 2011), we estimate the elasticity of CEO pay in the net-of-tax rate.

In our DiD specifications, we use 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 are more frequent 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 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 dependent and control variables, following Heider and Ljungqvist (2015).

Our DiD estimates show that CEOs receive economically and statistically higher pay two years after a large (≥1%) increase in personal income tax rates. CEOs receive an extra increase in pay growth of 6.4% to 7.4% following large tax increases, relative to CEOs who do not experience such tax shocks, controlling for other determinants of the evolution of compensation. Furthermore, the effect is asymmetric. In contrast to tax increases, the effect of a state income tax cut is statistically and economically insignificant. Thus, CEO compensation is asymmetric with respect to tax changes: it rises following tax increases but does not decline following tax decreases.

The DiD results survive various hurdles for credible identification. First, we estimate stacked DiD (Cengiz et al., 2019; Baker, Larcker, and Wang, 2022). Despite the smaller sample size, our estimates and conclusions are robust. Second, state tax changes do not arise from prior rapid growth in executive pay. They do not. Third, state tax changes may not otherwise be strictly exogenous, so we attempt to further remove political considerations by using a narrative approach (Romer and Romer, 2010; Giroud and Rauh, 2019). Our findings are the same.

Fourth, a concern is that both state tax changes and executive pay changes can be affected by local economic conditions. Exploiting the fact that local economic conditions tend to be more 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 state tax changes on CEO pay in our full sample is robust to the bordering-state setting. Fifth, the treated and control groups appear to exhibit parallel trends in CEO pay changes before both positive and negative shocks to tax rates. Sixth, 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 preemptive original choice of domicile. Finally, we apply DiD with a continuous treatment (Callaway et al., 2024) in order to address heterogeneity in "dosage" (size of the tax shock). The results again indicate that the response of CEO compensation to state personal income tax increases is economically and statistically significant, while tax decreases have no very little effect on CEO pay.

Triangulating evidence distinguishes the labor-market mechanism from governance-based rent extraction. First, the compensation response is stronger for non-founder CEOs, in industries with more potential employers, and in industries whose firms are distributed across more states. Second, the compensation response is not significantly larger when governance is weaker. In particular, it does not vary significantly with either high board cooption, a measure of weak internal governance, or low block ownership, a measure of limited external monitoring. Taken together, these findings support a labor-market mechanism and provide no support for the notion that governance-related rent extraction drives the increase in CEO compensation.

In our second empirical approach, we follow the method in Frydman and Molloy (2011) to regress the natural logarithm of the ratio of post-tax to pre-tax managerial pay on the logarithm of the inverse of the ratio of pre- to post-tax net-of-tax rates. This approach allows examination of the incidence of a shift in the managerial labor supply curve arising from an income tax shock. We find that when the net-of-tax rate (NOT) changes by 1% due to a state personal income tax shock CEO pay changes by 0.730% to 0.906%. These figures imply that 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. The estimates indicate that the supply curve for CEO services is at least 2.70 times and perhaps even as much as 9.64 times as elastic as the CEO demand curve.

Our analysis of the effects of state personal income tax changes on executive compensation contributes to several intersecting segments of the literature. We use changes in state personal income tax rates to advance the literatures on: (i) the determinants of the level and rate of change of managerial compensation; (ii) firm demand and executive supply (especially the extensive margin) in the managerial labor market; and (iii) the incidence of personal income taxes on the executive versus the firm. We build on prior studies that estimate the effects of taxes on executive pay, including Bird (2018) and Perry and Zenner (2001), who examine changes in the tax treatment of pay components, Frydman and Molloy (2011), who study federal tax reforms, and Goldman, Henley, and Lewellen (2024), who address convexity in the personal income tax schedule.

2. Empirical Design

We use two approaches to examine the changes, if any, in CEO pay in response to changes in personal income tax rates. We estimate: (1) a DiD model for repeated treatments, which we

describe just here and implement in Section 4; and (2) an elasticity model (in the net-of-tax rate), which we describe briefly here and deploy in detail in Section 6.

In a DiD analysis based on a single event, the treatment indicator (i.e., Treat x Post) typically is set to one in years after the event (as illustrated in the upper panel of Figure A2, Appendix 2). In our analysis, however, there are multiple shocks to tax rates through time. 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 indicator equal to one after the first shock would fail to capture the subsequent shocks (lower panel of Figure A2).

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 (Heider and Ljungqvist 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 of at least 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 A2). We estimate:

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

where *y* is CEO compensation, the superscript *Incr* (*Decr*) indicates a coefficient for tax increase (decrease), the subscript -2 (-1) indicates a coefficient for a tax shock two years (one year) ago, *m* is the CEO index, *t* is the time index, *f* is the firm index, *ind* is the industry index, and *y* is CEO compensation. $X_{m,f,t}$ is the vector of control variables (including characteristics of the firm that employs the CEO), Δ is the first difference operator (within CEO-firm), Γ is the coefficient vector

for the control variables, $\mu_{m,f}$ is the CEO-firm fixed effect, $\vartheta_{ind,t}$ is the industry-year fixed effect, and $\varepsilon_{m,t}$ is the error term. The control variables in *X* can be scaled, transformed using the natural logarithm function, or not transformed at all. We include the standard explanatory control variables from prior literature (per Edmans et al., 2017). Here and throughout $\Delta X_{m,f,t}\Gamma + \mu_{m,f} + \vartheta_{ind,t}$ 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, a significantly positive β_{-2}^{Incr} would indicate that CEO compensation increases two years following an increase in the state personal income tax rate. We consider changes in CEO compensation both one and two years after shocks to top state personal income tax rates because benchmarking and pay-formation processes used by many listed US firms generally include lags in data and response.[5] For a state personal income tax shock in year *t*, any new compensation contract that responds to the shock will be effective no earlier than year *t+1* or perhaps more likely one more year later, in year *t+2*. Accordingly, we expect a lag of at least one year and more likely two years for a response in CEO pay, if any, to a change in the personal income tax rate.[6, 7]

In our second approach, per Frydman and Molloy (2011) and their antecedents, we regress the natural logarithm of the ratio of post-tax to pre-tax managerial pay, $y_{m,t}/y_{m,t-k}$, on the logarithm

[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 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.

[6] We also estimate a stacked DiD model and DiD with continuous treatment. See Section 4.

[7] To elaborate further on timing (ibid.), US personal income taxes in year *t* usually need to be paid 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, which would come into effect the following year.

of the inverse of the ratio of post-tax-change (year *t*) *net-of-tax rate* (*NOT*) to the pre-tax-change (year *t-k*) net-of-tax rate, specifically $(NOT_{m,t-k}/NOT_{m,t}) = (1 - \tau^{F}_{m,t-k} - \tau^{St}_{m,t-k})/(1 - \tau^{F}_{m,t} - \tau^{St}_{m,t})$, with controls. The superscript denotes the federal (*F*) or state (*St*) personal income tax rate, *m* indexes the manager, and *t* and *t-k* index time. An estimate of the coefficient on the logarithm of the NOT equal to 1.0 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. Section 6 provides parameter estimates and shows how such estimates allow a comparison of the elasticities of demand and supply for managerial input.

3. Sample Construction

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 reported in Panel A of Table 1, 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.[8] 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 (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 across 18 states and 19 tax cuts across 17 states in our sample (Figure 1). Treated firms are those headquartered in states experiencing large tax shocks. In our baseline setting, control firms are those headquartered in states without large state income tax shocks.

[8] Statistics for changes in Top Personal Income Tax Rates at the Federal Level in the same period are reported in Appendix Table A1.

We obtain compensation data from Execucomp and corporate accounting data from Compustat. Data to calculate board cooption come from ISS ESG. We obtain blockholder ownership data from LSEG Institutional Holdings (13F). We extract 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. Appendix 1 displays variable definitions.

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, 595 when the firm has less than $50 million in market equity, 6,526 from banks and utilities, and 4,926 by eliminating firms that change state of domicile. Accordingly, over 1992–2022, the final sample includes 22,291 CEO-firm-year observations. 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.

Panel B of Table 1 reports summary statistics. The average CEO in our sample earns US$5.88M per year. In our empirical analysis, we control for ln(book value of assets), market-to-book assets, and CEO-firm performance (ROA), as well as CEO-firm fixed effects and industry-year fixed effects. Firm-year averages are $6.489B for book assets, 2.189 for market-to-book assets, and 4.7% for ROA.[9]

[9] An extensive literature in accounting and corporate finance establishes that these variables are related to the level and structure of executive pay. See Smith and Watts (1992), Bizjak et al. (1993), Core et al. (1999), Murphy (1999), Coles et al. (2006), and Frydman and Molloy (2011). Also see the Edmans et al. (2017) survey. In general, we include

4. DiD Analysis: The CEO Pay Response to Personal Income Tax Rate Changes

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. Because small changes in personal income tax rates are less likely to trigger pay negotiations between CEOs and their firms, we expect CEO compensation in these states to remain relatively unaffected, making them suitable candidates for the control group. A potential concern, however, is that this control sample is not perfectly clean. Accordingly, following de Chaisemartin and D'Haultfoeuille (2020), as a robustness test we clean the base control sample further by eliminating CEOs of 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 an overall sample (15,563) that includes a smaller but "spotless" control sample. The dependent variable is Δln(TDC1).

4.1. Large State Personal Income Tax Increases

Table 2 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. 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, relative to normal pay growth based on firm performance, assets, MTB, and factors captured by CEO-firm and

CEO-firm and industry-years fixed effects and, in some instances, we control for debt to assets, stock return, volatility of stock return, the state corporate income tax rate, and other controls.

industry-year fixed effects. We observe no significant changes in compensation in the adjacent lagged year of a tax increase. It takes two years for CEO pay to adjust following a tax increase.

These estimates for large state personal income tax shocks may be attenuated towards zero insofar as they are based on the control sample that includes small state income tax shocks. To assess robustness, we use the smaller spotless control sample. Model 4 (6) of Table 2 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, even though using the spotless control sample reduces the number of CEO-firm observations.[10]

4.2. Large State Income Tax Decreases

In contrast to the response following tax increases, we find no abnormal decrease in CEO compensation following a large state personal income tax decrease. As columns 2 and 3 of Table 2 report, the estimated coefficients on the once- and twice-lagged tax-decrease indicators are close to zero and statistically insignificant. Using the spotless control sample does not alter this finding: in columns 5 and 6, the corresponding coefficient estimates remain economically small and statistically insignificant.

The asymmetric response is consistent with a competitive retention mechanism. An increase in the headquarters-state tax rate reduces the CEO's after-tax compensation relative to employment opportunities in lower-tax states, making those outside opportunities more attractive and giving the current firm an incentive to increase compensation. By contrast, a tax decrease improves the CEO's after-tax position at the current firm but need not reduce the compensation available in the

[10] Using an 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 2. Moreover, for all results reported below, the estimates using the intermediate control sample are similar to those using the base and spotless control sample.

external labor market or otherwise create downward pressure on benchmark-adjusted pay. While a decline in state income tax rate benefits the executive, executives are unlikely to ask for a decrease in pay. Furthermore, firms are unlikely to impose a decrease in nominal pay that would economically and symbolically diminish the executive's stature and reduce likelihood of retention. Thus, a competitive retention mechanism need not generate symmetric compensation responses to tax increases and decreases. We examine the retention mechanism more directly in the cross-sectional tests later.[11]

4.3. Further Evidence and Robustness Tests

4.3.1. Parallel Trends

We compare CEO pay changes [Δln(TDC1)] in the treated group and the control group in years around a shock to a state top personal income tax rate. Panel A (B) of Figure 2 plots the yearly differences for large tax increases (decreases). The dots represent the average yearly differences in CEO pay changes [Δln(TDC1)] between treated and control groups. The upper and lower bounds show the 90% confidence intervals. Consistent with the parallel trends assumption, in years before the event year (year *t*), i.e. year *t-2* and year *t-1*, the differences between treated and control groups are not statistically different from zero. Mirroring the results in Table 2, CEO compensation increases (is unchanged) after a large state personal income tax increase (decrease).

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

To alleviate the potential reverse causality concern that high growth in executive pay could trigger regulatory intervention in the form of a higher marginal tax rate for high earners, we regress the indicator *Tax Increase* (*Decrease*) on CEO pay growth in a state one and two years prior, controlling for state characteristics, including state debt, state GDP, tax revenues, cash savings,

[11] In supplementary tests reported in Appendix Table A2, we examine non-CEO named executive officers. The results indicate effects of state personal income tax changes on non-CEO NEO compensation that are smaller than the estimates for CEOs and that are not reliably different from both zero and the estimates for CEOs.

population, government indicator (democratic governor = 1, otherwise = 0), and unemployment rate. The test sample is at the state-year level, so we include state fixed effects 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 1998-2020. Appendix Table A3 reports the results. State-level personal income tax changes do not appear to be associated with prior CEO pay growth in the specific state. We also run robustness tests controlling for state characteristics in our DiD analysis. As shown in Appendix Table A4, the results remain robust after controlling for state GDP, political leadership, unemployment, population, debt, revenue, and cash holdings.

4.3.3. Exogenous Tax Shocks Identified by a Narrative Approach

To address political economy considerations as an omitted variable, 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. The categories are: (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. While in some sense one could argue that *all* tax shocks are endogenous, Romer and Romer (2010) define the last two categories as exogenous tax shocks. Likewise, to form the treated group we include only the 38 (of 46 total) large tax shocks defined by the narrative approach as exogenous.[12]

Appendix Table A5 reports results somewhat larger than those in Table 2. Using the base (spotless) control sample, CEO pay increases by 6.8% to 6.9% (8.1% to 8.3%) two years following

[12] Giroud and Rauh (2019) use the same approach and study the effects of state taxation on the reallocation of business activity. 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 sample period for this test is 1992-2021.

a large increase in personal income tax rates. There is no significant effect on pay for large tax decreases.

4.3.4. Neighboring Control States Without Tax Shocks

Local economic conditions potentially 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. Thus, we restrict control firms to those 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 large shock to the personal income tax rates (Appendix Figure A3). Appendix Table A6 reports the results. The effects of tax increases on CEO pay remain positive and statistically significant [models 1 and 3 (4 and 6) for the base (spotless) control sample], while the effects of tax decreases remain insignificant [models 2 and 3 (5 and 6)].

4.3.5. Preemptive Locational Choice: Distance to the Nearest Other State

Supposing that a CEO should be proximate to corporate HQ for peak performance (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 thereby insulated from the state tax shock. The estimated coefficient on the interaction term should be positive if a sizable number of CEOs in the sample are domiciled elsewhere and thereby avoid the state tax shock. Appendix Table A7 reports that the interaction coefficient estimate is essentially zero. CEO preemptive location and reactive relocation are unlikely to contaminate our main findings.

4.3.6. Placebo Test

To evaluate the credibility of our main baseline estimate, we conduct a placebo test using 1,000 re-assignments of the treatment variable. We randomly assign large tax increases and

decreases to CEO-years, setting the mean of the increases and decreases equal to the actual sample mean at the CEO-year level. The resulting distribution of placebo coefficients is tightly centered around zero. Moreover, only 1.0% of the simulated placebo treatments yield a coefficient equal to or larger than our empirical baseline estimate of 0.07. This yields an empirical p-value of 0.01, strongly suggesting that our primary findings are not driven by random chance or unobserved data artifacts. See Table A8.

4.3.7. Concerns about State-level Corporate Income Taxes and Recession Years

During our sample period, there were changes in corporate income tax rates that could influence corporate decisions, including executive compensation. In Panel A of Appendix Table A9, we exclude firms headquartered in states experiencing a large corporate income tax shock of at least one percentage point in any sample year. The DiD results remain robust. In Panel B, we instead control directly for state corporate income tax rates, together with additional firm-level controls, including Debt/Assets, stock returns, and return volatility.[13] The estimated effects on personal state income tax changes remain robust, while the coefficients on state corporate income tax rates are statistically insignificant. The Table 2 results are also robust to dropping Covid and other recession years (Appendix Table A10).

4.3.8. Stacked DiD

We also estimate the effects of changes in personal US state income tax rates on CEO compensation using a stacked DiD approach (e.g., Cengiz et al., 2019). This setup addresses the possibility of heterogeneity in treatment effects. We construct a [-2, +2] stack window for each large tax increase or decrease (at least 1%). States with any other large changes (increases or

[13] We use top rates of state corporate income taxes in the tests. Most states that levy a corporate income tax use a single-rate tax structure. In states with graduated rate schedules, the large publicly traded firms in our sample are generally subject to the top marginal rate.

decreases) at any point within a stack window are excluded. This stacked DiD setting excludes any state experiencing more than one large tax shock within a five-year window. As a result, the sample includes 12 large tax increases and 14 large tax decreases, compared with 27 increases and 19 decreases in the full sample. CEOs of firms headquartered in states with large changes are in the treatment group. The remaining CEOs are in the control group. For each stack, *Tax Increase* (*Tax 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 at the central year of the stack, and zero otherwise. *Post1* (*Post2*) is an indicator variable for the first (second) year following a large tax shock. We estimate the model for tax increases and decreases separately.

Table 3 reports stacked DiD estimates that, despite the smaller sample size arising from the construction of clean stacks, are similar to the DiD estimates in Table 2.[14] The coefficient on the lagged tax indicator for increases is 0.073 ($p < 0.001$) while the estimate on the lagged tax-decrease indicator is close to zero. Moreover, the stacked-DiD estimates remain similar when we restrict the sample using the narrative approach or neighboring-state controls (App. Tables A11, A12).

4.3.9. DiD with Continuous Treatment

The DiD design compares outcomes between treated and untreated groups with and without the treatment (the tax shock). We follow the method of Callaway et al. (2024) to include the "dose" or intensity of the treatment, specifically the size of the tax shock, in the DiD model. Continuous Tax Increase (Decrease) is the CEO's state personal income tax rate increase (decrease), in percent when the magnitude of that change was at least one percent. Just as for the DiD and stacked DiD estimates (Tables 2 and 3, resp.), the estimates in Appendix Table A13 are

[14] Appendix Figure A4 provides supportive evidence for the parallel trends assumption of the stacked DiD analysis.

positive and economically and statistically significant for tax increases and negligible for tax decreases.[15]

5. Labor Market Channel versus Governance Channel

The increase in CEO compensation following a state personal income tax increase can be understood through at least two leading explanations. The first is a competitive labor-market channel. A higher tax rate reduces the CEO's after-tax compensation at the current firm relative to employment opportunities in lower-tax states, thereby strengthening the CEO's outside option and tightening the firm's retention constraint. If replacing the CEO is costly or the firm's demand for the matched CEO's services is relatively inelastic, the firm may respond by increasing compensation. This explanation predicts a stronger pay response when outside opportunities are more attractive and when the CEO is more willing and able to pursue them.

A second explanation is agency costs and rent extraction. A tax increase may provide an opportunity for an influential CEO to obtain additional compensation beyond that warranted by competitive retention, particularly when corporate governance is weak. These two explanations are not equivalent: the labor-market channel emphasizes variation in outside options and mobility, whereas the agency channel emphasizes variation in governance and managerial influence. We therefore use cross-sectional tests based on these distinct predictions to assess which explanation is more consistent with the evidence.

5.1. Labor Market Channel

[15] As a check for consistency in economic magnitude, application of the primary coefficient estimates, 0.030 and 0.031, to the average state personal income tax increase of 1.95% yields 0.059 and 0.060, resp., which approximate the analogous coefficient estimates in Table 2 of 0.064 and 0.066.

A state personal income tax increase reduces the CEO's after-tax compensation at the incumbent firm relative to potential employment at firms headquartered in lower-tax states. If outside employment opportunities constrain the firm's compensation decision, the pay response should be stronger when the CEO is more willing to leave, when there are more potential employers, and when those employers are geographically dispersed across states. Table 4 examines these three predictions.

5.1.1. Founder Status and Attachment to the Firm

Our first test examines whether the compensation response depends on the CEO's attachment to the incumbent firm. Founder CEOs are likely to have stronger firm-specific ties than non-founder CEOs. These ties may include firm-specific human capital, personal identification with the firm, concentrated ownership, and a greater commitment to the organization they created. As a result, founder CEOs may be less willing to pursue outside employment opportunities, making the threat of departure less credible. The labor-market channel therefore predicts a stronger pay response for non-founder CEOs.

We classify a CEO as a founder if the CEO's tenure reported in Execucomp began before the firm first appeared in Compustat. We define an indicator variable *Non Founder* that equals one for all other CEOs. Column 1 of Table 4 interacts the indicator for a large tax increase two years ago with the lagged *Non Founder* indicator. Because the regression includes CEO-firm fixed effects, the standalone item, *Non Founder* indicator, is absorbed. The coefficient on Tax Increase therefore represents the estimated response for founder CEOs, while the interaction coefficient measures the incremental response for non-founder CEOs.

The interaction coefficient is 0.155 and is statistically significant at the 1% level (t=4.64). Thus, the compensation response to a state personal income tax increase is substantially larger for

non-founder CEOs than for founder CEOs. The point estimate for non-founder CEOs is 9.3% (= -0.062 + 0.155). The economically and statistically significant difference between the two groups is consistent with the labor-market mechanism: firms respond more strongly when the CEO is less attached to the incumbent firm and therefore more likely to exercise an outside employment option.

5.1.2. Number of Potential Employers in the Industry

Our second test examines the thickness of the executive labor market. The number of firms operating in the CEO's industry provides a measure of the number of potential employers that may value the CEO's industry-specific experience. When an industry contains more firms, the CEO is likely to have more outside employment opportunities. A thicker industry labor market should therefore strengthen the CEO's outside option and increase the incumbent firm's incentive to offset a state tax increase through higher compensation.

For each industry-year, we count the number of firms in the industry. *High # Firms in Ind* equals one when this number is above the bottom tercile of the annual distribution and zero otherwise. Column 2 interacts the indicator for a large tax increase two years ago with the lagged *High # Firms in Ind* indicator. The coefficient on Tax Increase captures the response among CEOs in industries in the bottom tercile of the number-of-firms distribution. The interaction coefficient captures the incremental response in industries with a larger number of potential employers.

The coefficient on *Tax Increase*, 3.6%, represents the response in the bottom tercile of the number of firms in the industry. The coefficient on the interaction is 0.120 and is statistically significant at the 1% level (t=2.70). The compensation response therefore is materially larger when the CEO works in an industry with more potential employers. The corresponding point estimate for industries above the bottom tercile is 15.6% (= 0.036+0.120). The effect of state

personal income taxes on CEO compensation is substantially larger in thicker executive labor markets.

5.1.3. Geographic Dispersion of Potential Employers

The number of firms in an industry measures the overall thickness of the executive labor market, but it does not directly capture whether the CEO can avoid the tax increase by moving to a firm in another state. Our third test therefore examines the geographic dispersion of firms within the industry. When an industry operates across many states, the CEO is more likely to have potential employers in states with different personal income tax rates. Geographic dispersion should make interstate outside options more relevant and increase the incumbent firm's incentive to adjust compensation following a state tax increase.

We measure geographic dispersion using the number of states in which firms in the CEO's Fama-French 12 industry are located. *High # State Industry* equals one when firms in the industry operate in more than 35 states and zero otherwise. This category tends towards Manufacturing, Business Equipment, Shops, and Other. Column 3 interacts the indicator for a large tax increase two years ago with the lagged *High # State Industry* indicator. The coefficient on Tax Increase represents the response in less geographically dispersed industries, while the interaction coefficient measures the incremental response in industries that operate in more than 35 states.

The interaction coefficient is 0.087 and is statistically significant at the 5% level (t=2.33). The compensation response is 8.7 percentage points larger in geographically dispersed industries. The implied point estimate for geographically dispersed industries is approximately 10.2% (= 0.015+0.087). This result is consistent with the prediction that interstate employment opportunities make the CEO's outside option more valuable following a state-specific tax increase.

Taken together, the three specifications provide complementary evidence for the labor-market channel. The compensation response is stronger when the CEO has weaker attachment to the incumbent firm, when the industry contains more potential employers, and when those employers are distributed across a larger number of states. These results link the pay response both to the CEO's willingness to exercise an outside option and to the availability of outside employment opportunities.

5.2. Governance Channel

We next examine whether the compensation response reflects rent extraction facilitated by weak corporate governance. If CEOs use state personal income tax increases to extract additional compensation, the pay response would be stronger when the board is less effective in constraining the CEO or when shareholders have weaker incentives to monitor management. We measure internal governance using board cooption, the fraction of directors appointed after the incumbent CEO assumed office (Coles, Daniel, and Naveen, 2014). Because directors appointed during the CEO's tenure may be less effective monitors, higher cooption indicates weaker internal governance. We measure external monitoring using block ownership, defined as the aggregate fraction of shares held by shareholders owning at least 5% of the firm. Large shareholders have stronger incentives to incur the costs of monitoring management (Shleifer and Vishny 1986; Holderness 2003). In our DiD analysis, we define High Cooption as an indicator equal to one when Cooption is above its annual median, and Low Block Ownership is an indicator equal to one when Block Ownership is below its annual median.

Table 5 provides no support for the governance channel. The interaction between the tax increase indicator (t-2) and lagged High Cooption is negative and statistically insignificant, with a coefficient of −0.058 (t = −0.75). The interaction with lagged Low Block Ownership is also

negative and statistically insignificant, with a coefficient of −0.043 ($t = -1.04$). The compensation response is not larger when the board is more coopted or blockholder monitoring is weaker.

These results suggest that weak governance is unlikely to account for the increase in CEO compensation following state personal income tax increases. In contrast, the compensation response varies systematically with CEOs' outside employment opportunities and their attachment to the incumbent firm. The evidence therefore favors a labor-market mechanism over a governance-based rent-extraction explanation.

5.3. The Components of Pay and Executive Retention

Figure A5 tracks the components of CEO compensation over time, with stock pay becoming the largest component starting 2006. To supplement the results in Table 2 on total CEO compensation, we estimate variants of equation (1) for the individual components of pay, including annual salary and bonus, long-term cash incentive compensation, stock awards, and option awards.

Including controls and CEO-firm and industry-year fixed effects, both long-term incentive plan cash pay (NonEqIncent) (Table 6, column 3) and stock pay (column 4) increase significantly two years following a large increase in the state personal income tax rate. Relative to the base (spotless) control sample, two years after a large tax increase NonEqIncent increases by 10.9% (12.2%) and the GDFV of stock pay increases by 6.6% (6.0%).[16] In contrast, the estimated responses of salary, and annual bonus are economically small and statistically insignificant.

The concentration of the compensation response in stock and long-term incentive compensation is consistent with a retention-based interpretation. These forms of pay commonly depend on continued employment, vest over time, and/or are tied to multi-year performance, thereby increasing the cost to the CEO of leaving the firm. This evidence complements the cross-

[16] Further examination of the data indicates that the increase in stock awards is not due to "replacement grants".

sectional results on outside employment opportunities and CEO attachment to the firm, although the composition of pay alone does not uniquely identify the retention channel.

6. The Elasticity of CEO Compensation in the Net-of-Tax Rate

To assess further the nature of the pay response to state tax shocks, we estimate the elasticity of CEO pay in the net-of-tax rate. Our design follows that of Frydman and Molloy (2011).[17] First, we directly estimate the elasticity of the CEO pay response in the inverse net-of-tax rate, both without and with adjusting for the state and local tax deduction. We consider both federal- and state-level changes in personal income tax rates and address large tax shocks alone and both small and large shocks together.[18] Second, we use the NOT estimates to derive ranges for the relative elasticities of demand and supply for managerial input.

6.1. Estimates of the Elasticity of CEO Compensation in the Inverse Net-of-Tax Rate

Let $g_{m,t}$ be the equilibrium growth rate in CEO pay, over period *t-k* to period *t*, based on CEO-firm performance, size, asset tangibility, etc. Denote $\hat{y}_{m,t}$ as the nominal pay of the CEO in period *t* that makes the CEO whole after-tax, holding all else constant: $\hat{y}_{m,t} \cdot (1 - \tau^{F}_{m,t} - \tau^{St}_{m,t}) = (1 + g_{m,t}) \cdot y_{m,t-k} \cdot (1 - \tau^{F}_{m,t-k} - \tau^{St}_{m,t-k})$, or $\hat{y}_{m,t} \equiv (1 + g_{m,t}) \cdot (NOT_{m,t-k}/NOT_{m,t}) \cdot y_{m,t-k}$. 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 actual period-*t* CEO pay, $y_{m,t}$, of a prior change in the personal income tax rate:

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[17] As a benchmark, following Frydman and Molloy (2011) we repeat the net-of-tax elasticity analysis using federal personal income tax shocks. Appendix Table A14 reports small and statistically insignificant estimates, consistent with prior studies and with the interpretation that the state-level response reflects interstate outside options, because federal tax shocks apply nationwide and cannot be avoided by relocating to another state.

[18] Local income taxes are low (between 1% to 3%, with a few exceptions, https://taxfoundation.org/local-income-taxes-city-and-county-level-income-and-wage-taxes-continue-wane/), so we approximate the personal income tax rate as the sum of federal and state income tax rates and ignore municipal and local income tax rates.

$$Ln\left(\frac{y_{m,t}}{y_{m,t-1}}\right) = \Pi_0^q + \Pi_{-2}^q Ln\left(\frac{NOT_{m,t-3}}{NOT_{m,t-2}}\right) + \Pi_{-1}^q Ln\left(\frac{NOT_{m,t-2}}{NOT_{m,t-1}}\right) + \Delta X_{m,f,t}^q \cdot \Gamma^q + \mu_{m,f}^q + \vartheta_{ind,t}^q + \varepsilon_{m,t}^q, \quad (2)$$

where *m* indexes the manager, *f* indexes the firm, *t* and *t-k* index time, superscript $q = St$ (or *F*) signifies the data and parameter estimate are based on state (federal) personal income tax shocks, and $\Delta X_{m,f,t}^q \cdot \Gamma^q + \mu_{m,f}^q + \vartheta_{ind,t}^q$ captures determinants, other than tax rate changes, of the change in CEO pay. For state tax changes we expect the estimate of Π_{-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, Π_{-1}^{St} could be positive. 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.

Table 7 displays the results. Columns 1 and 2 consider large ($\Delta\tau^{St} \geq 0.01$ or $\Delta\tau^{St} \leq -0.01$) 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 $\Pi_{-2}^{St} = 0.906$ ($t = 2.30$) and 0.730 ($t = 2.01$). 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% or 0.730% increase in total compensation two years later, respectively. Moreover, the sum of the coefficients on the lagged once and twice NOT ratios are 0.947 (column 1) and 0.826 (column 2). An estimate of 1 would be consistent with an increase in pay that makes the CEO exactly whole in terms of after-tax pay.

The estimates indicate that the CEO is substantially compensated two years later for a change in state personal income tax rate.

The estimates in Column 3 are based on both large and small state tax changes. It is possible that all tax rate changes, large or small, matter for CEO pay. The estimates on the inverse net-of-tax rate, however, are both statistically insignificant: Π_{-2}^{St} = 0.405 (t = 1.20) and Π_{-1}^{St} = 0.315 (t = 0.75). The sum of the two estimates is $\Pi_{-2}^{St} + \Pi_{-1}^{St}$ = 0.720, which is sizable and similar to the two sums of the once- and twice-lagged estimates for large state shocks..

To illustrate the economic significance of the parameter estimates, suppose the state personal income tax rate goes up from period $t-3$ to $t-2$ by the average of increases (0.0195). 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 0.437 at $t-2$. Then $Ln(NOT_{m,t-3}/NOT_{m,t-2}) = Ln(1.0346)$ becomes 0.0340 rather than 0 (had there been no tax rate change) after the state tax increase. Using the elasticity estimates from columns 1 and 2 of Table 7 implies a 3.13% ($e^{(0.0340\ x\ 0.906)} - 1$) and 2.51% ($e^{(0.0340\ x\ 0.730)} - 1$) proportional abnormal (due to the tax shock) increase in CEO pay. Compared to a coefficient estimate of 1, which would be consistent with an increase in pay that makes the CEO exactly whole in terms of after-tax pay, the estimates indicate that the CEO is considerably compensated two years later for a change in state personal income tax rate.

The analysis above does not account for the state and local tax deduction (SALT). The SALT deduction, which has allowed itemizing taxpayers to deduct certain state and local taxes from their federal adjusted gross income, actually predates the establishment of the permanent federal income tax as instituted by the Revenue Act of 1913. Thus, the SALT deduction likely was relevant for

CEOs and other top executives until (but likely not after) the Tax Cuts and Jobs Act of 2017, which capped the deduction for itemizers at $10,000 (filing jointly) for years 2018-2025.

To adjust for the deductibility of state personal income taxes at the federal level, the net-of-tax for years 1992-2017 becomes $NOT_{m,t} \equiv (1 - \tau^{F}_{m,t}(1 - \tau^{St}_{m,t}) - \tau^{St}_{m,t})$, versus $NOT_{m,t} \equiv (1 - \tau^{F}_{m,t} - \tau^{St}_{m,t})$ for sample years 2018-2022. Based on this adjustment, we estimate Equation (2) for large state personal income tax shocks. Again, 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. Table 8 reports the estimates of the *t-2* lagged response coefficients as Π^{St}_{-2} = 1.159 and 0.835, which exceed somewhat the analogous estimates in Table 7.[19] The sums of the once- and twice- lagged estimates are 1.057 and 0.608, resp. These sums are similar to the sums of once-and twice-lagged estimates on the net-of-tax rate in columns 1 and 2 in Table 7

6.2. Supply and Demand Elasticities for CEO Input.

We consider whether there is a combination of standard supply and demand effects that accommodate the elasticity estimates reported in Section 6.1. Setting aside the SALT deduction, 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

[19] While Π^{St}_{-2} = 1.159 (Table 8, col. 1) lies outside of the unit interval, the estimate is not statistically different from 1.

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 $\varepsilon_D \in (-\infty, 0]$, $-\varepsilon_{y,NOT}^{St} = \varepsilon_S/(\varepsilon_S - \varepsilon_D) \in [0, 1]$.

Note that the estimated coefficient from Equation (2) is the negative of the elasticity of executive pay in the inverse net-of-tax rate: $\Pi_{-k}^{St} = -\varepsilon_{y,NOT}^{St} \equiv -(NOT_{t-k}/y_t)(dy_t/dNOT_{t-k})$. Both of the estimates of $-\varepsilon_{y,NOT}^{St}$ (for k = 2) from Table 7, 0.906 from column 1 and 0.730 from column 2, fall inside the $[0, 1]$ 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 demand 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 (to three-eighths) as elastic as the supply curve, with $\varepsilon_D^{St} = -0.1038\ \varepsilon_S^{St}$ (or $\varepsilon_D^{St} = -0.3699\ \varepsilon_S^{St}$). The relation $\varepsilon_S^{St} = -2.7037\ \varepsilon_D^{St}$ likely is most credible, insofar as the underlying estimate, $\varepsilon_{y,NOT}^{St} = -0.730$, is based on more aggressive controls.

In any event, having 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 firm's demand curve for the matched CEO's input appears to be highly inelastic relative to the executive's 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 relatively mobile or deployable relative to the assets of the firm, the supply curve would be relatively more elastic than the demand curve. [20, 21]

7. Further Considerations

7.1. Data

Several data items warrant brief attention. First, a departing or arriving CEO could introduce noise into our empirical analysis. CEOs who move obtain higher pay (e.g., Fee and Hadlock, 2003; Coles et al., 2018), and the former reports that the compensation change can be explained in part by reimbursement for the equity position forfeited at the prior employer and by the prior employer's performance. Accordingly, we have restricted 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 CEO-year observations have a tax change in two consecutive years. First-differencing removes unobserved firm-specific fixed effects in the corresponding levels equation.

Third, significant elements of our empirical analysis rely on the idea that changes in TDC1 reflect pay adjustments that arise in response to changes in the personal income tax rate. Total compensation includes some or all annual salary, annual bonus, and long-term cash bonus, as well

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[20] Based on CEO-to-CEO transitions across firms (Execucomp data), when a CEO moves to the next CEO position, in 74% of cases the CEO moves to a different state. Geographical continuity is unlikely to be a hard and fast job search requirement for many CEOs.

[21] For context, we consider estimates of the supply and demand elasticities for other populations, such as "rank and file" workers. The wide dispersion of such estimates has spawned a longstanding debate over methods and results (McClelland and Mok, 2012; Lichter et al., 2015). One hypothesis is that firms have substantial market power relative to the rank and file. For example, Azar et al. (2022) estimates that the market-level labor supply elasticity is 0.5, while the firm-level labor demand elasticity is 4.8, indicating that workers produce 21% more value than their wage level and that firms have significant monopsony power. The estimates we produce herein indicate the opposite, specifically that CEOs have significant market power and firms have highly inelastic demand curves for managerial input. Along these lines, Mui and Schoefer (2025), based on US and German data, report a short-run labor elasticity at the extensive margin (participation) above 3. Based on our estimates, a supply elasticity of 3 would imply a labor demand elasticity of 0.3114 = 3 x 0.1038 to 1.1097 = 3 x 0.3699.

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.[22] Performance-vesting provisions (Bettis et al., 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 taxable income.

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, we assume that GDFV 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. Then $\Delta Ln(y_{m,t})$ would be an appropriate proxy for the change in the discounted value of taxable income, reinforcing the use of $\Delta Ln(y_{m,t})$ on the left-hand side of regression specifications.

7.2. Do Prior Locational Choices Attenuate the Estimates?

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

[22] In our sample period, 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 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 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.

Locational considerations, however, potentially have a countervailing effect. Some CEOs may already be taxed in another state that both differs from the firm's domicile and was not treated with an income tax shock.

To supplement Table A7, we argue further that such pre-emptive tax avoidance is unlikely to significantly attenuate our estimates of the sensitivity of executive pay to changes in the personal state income tax rate. First, there are few relevant reciprocal state tax agreements. Likewise, one-way agreements appear in only 2.51% of the 2,550 possible one-way arrangements among the 50 states and Washington, DC. Moreover, a number of states, including New York, have erected additional barriers to the locational approach to avoiding state income tax. Second, Duchin and Sosyura (2021) 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. Duchin and Sosyura (2021) report that the percentage of CEO-firm-years with such a commuter CEO is 1.82%, which likely represents an upper bound on the proportion of CEOs who preemptively avoid a state tax increase in their work state. Third, we find in our sample that in 99.3% of CEO-year cases the CEO owns a residence located in the same state as the corporate headquarters.

We conclude 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.[23], [24]

7.3. Gross-up Provisions

[23] Appendix 3 contains a more detailed discussion of whether preemptive tax avoidance attenuates the estimates.

[24] Another locational consideration is that in response to an increase in the state personal income tax rate a firm could relocate to a state with a lower persona income tax rate. Presumably most top executives would relocate as well and, in doing so, would avoid the state income tax increase in the former domicile. We found no relation in our sample period between the likelihood that a firm relocates and the once- and twice-lagged indicator for an increase in the state personal income tax rate.

A tax gross-up provision is an agreement where a company pays an extra amount to cover extra personal income (e.g., an increase in the state income tax rate) or excise (e.g., on a golden parachute triggered by a merger) taxes. A gross-up can make the executive entirely "whole" on an after-tax basis. In our sample, some firms in some years report the presence of such a provision in their proxy statement. The question arises as to whether such provisions drive the connection between the top state personal income tax rate and executive pay.

We search the proxy statements for all firms in our sample over the full sample period. About 40 percent of firms in our sample never report the presence of a gross-up provision in any year in our sample period, while 60% report a gross-up in one or more years. Nonetheless, in this second subsample, gross-ups were never frequent and have become even less frequent. Shareholder groups and governance watchdogs have criticized tax gross-ups as hidden or excessive compensation, leading many public boards to phase them out. We re-estimate the models in Table 2 separately for the two subsamples The parameter estimates for the gross-up-free subsample (0.070, t=2.57, and 0.072, t=2.64) are very close to those in columns 1 and 3 (Table 2). The estimates in the subsample of firms that reported a gross-up provision at least once are somewhat smaller, at 0.047 (t=2.28) and 0.046 (t=2.31), but significant. CEO pay is sensitive to state income tax increases regardless of the presence of a tax gross-up.

7.4. CEO Departures, Retention, and Firm Performance.

There are 22,291 CEO-firm-year observations in the sample, with 1,131 or 5.1% (580 or 2.6%) total (large) firm-year-CEO increases in the state personal income tax rate. The association of a CEO with a firm, as indicated in Execucomp, changes 3100 times in our sample. Of these, 3010 disappear from Execucomp while 90 assume another position as CEO. Of these 90, 42 assume that position in another state and 48 stay in the same state.

Among CEOs exposed to a state personal income tax increase, voluntary turnover is significantly less likely when the firm subsequently raises the CEO's pay (Table A15). In contrast, a CEO experiencing an increase in state personal income tax rate who fails to get a pay raise in the current firm is more likely to depart. One possibility is that the affected firm "invites" the CEO to voluntarily depart by not adjusting pay in response to a tax increase. Under this narrative, the firm benefits from the departure.[25] In contrast, perhaps the firm is distressed or otherwise constrained in the extent to which it can raise pay to the prevailing after-tax market pay for a CEO. A CEO turnover under such circumstances is more likely to damage the firm.

Table A16 assesses subsequent firm performance contingent on whether the firm responds to a state personal income tax increase with a pay increase. Changes in both in ROA and stock returns are significantly higher if the firm responds with a pay increase (Panel A). Panel B reports estimates from models that include controls for prior CEO-firm performance, as a measure of CEO quality, as well as other covariates. The change in ROA and stock return again are significantly higher for firms that increase CEO pay following a large personal income tax increase. These findings are consistent with the idea that boards can offset personal income tax shocks and, by doing so, retain valuable talent to facilitate firm performance.

8. Conclusion

We use staggered changes in U.S. state personal income tax rates to study tax incidence in the executive labor market. Following state tax increases of at least one percentage point, CEO pay growth rises by 6.4% to 7.4% two years later. Comparable tax decreases do not reduce pay. Estimates based on changes in net-of-tax rates imply that firms offset a substantial portion of the

[25] We find no significant effect on the likelihood of explicitly forced turnover in our sample.

additional tax liability borne by CEOs. This asymmetric response is consistent with compensation adjusting upward when tax increases tighten firms' retention constraints but not mechanically adjusting downward when tax rates fall.

The evidence favors a labor-market explanation. The pay response is stronger for non-founder CEOs and when executives have more outside employment opportunities, including in industries with more potential employers and greater geographic dispersion. The increase is concentrated in stock and long-term incentive compensation, forms of pay that increase the cost of leaving the firm. Among CEOs exposed to tax increases, an increase in pay is also associated with lower voluntary turnover and stronger subsequent firm performance. By contrast, the pay response is not stronger when boards are more coopted or block ownership is lower. These findings support a retention mechanism based on outside options rather than a governance-based rent-extraction explanation.

The net-of-tax estimates also provide information about the structure of the executive labor market. They imply that the supply of CEO services is 2.7 to 9.6 times as elastic as firm demand. This relative elasticity comparison is consistent with the importance of the extensive margin: executives can pursue employment at other firms and in lower-tax states, whereas firms may find it costly to replace a matched CEO. The negligible response to federal tax shocks further supports this interpretation because a federal tax change does not alter the relative attractiveness of employment across states.

Our findings have broader implications for tax incidence. Personal income taxes imposed on high-income executives need not be borne entirely by those executives when compensation can adjust and managerial talent is mobile. At the state level, a substantial portion of the burden can be shifted to the firm through higher compensation. Absent detailed data, we cannot determine

how this cost is ultimately distributed among shareholders, creditors, employees, customers, and other stakeholders. Identifying its ultimate incidence remains an important question for future research. More generally, the results show that the economic incidence of personal income taxation depends on the relative elasticities of executive supply and firm demand.

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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 no less than one percentage point for earners in the top tax bracket. The blue (orange) bars are for increases (decreases) in tax rates.

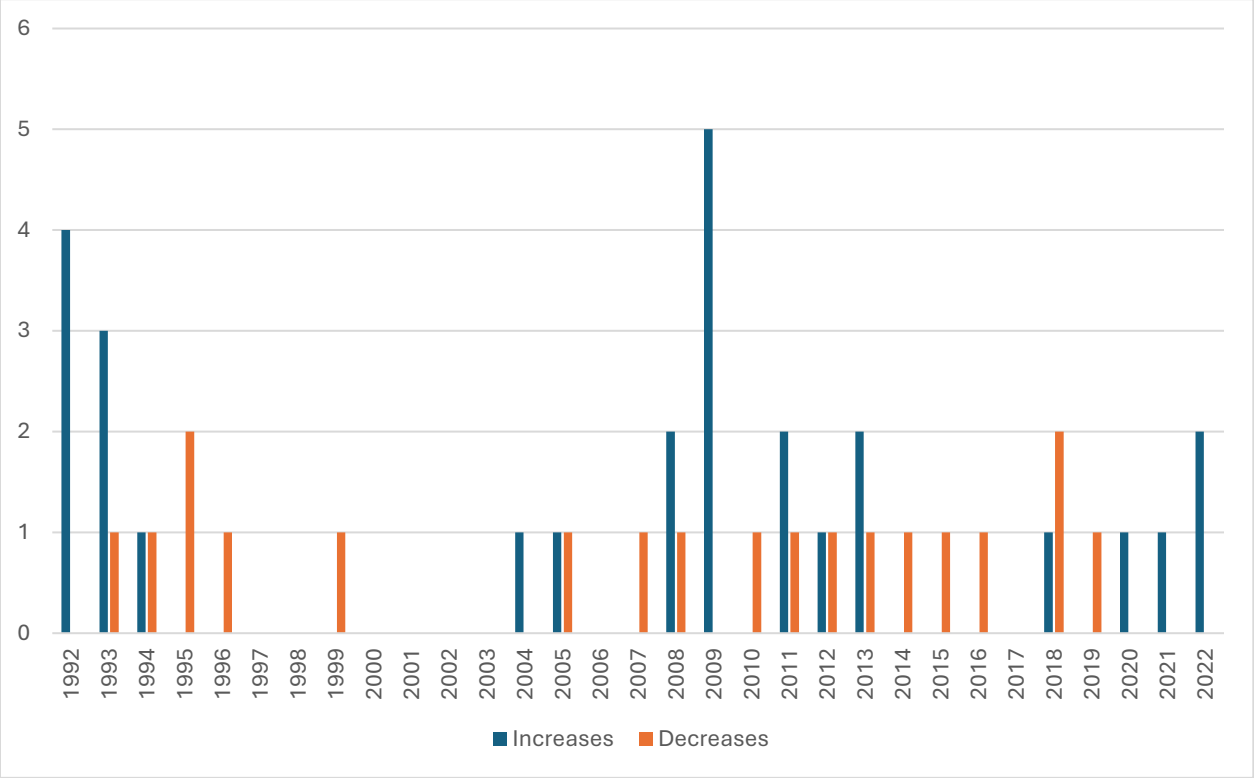
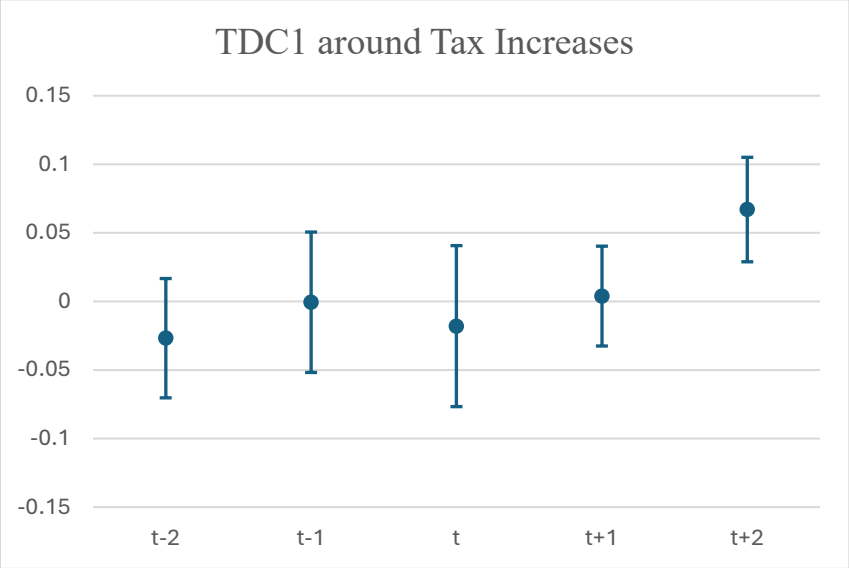


Figure 2. Differences in CEO Pay Changes Between Treated and Control Groups in Years Around Tax Changes

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 (no less 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 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

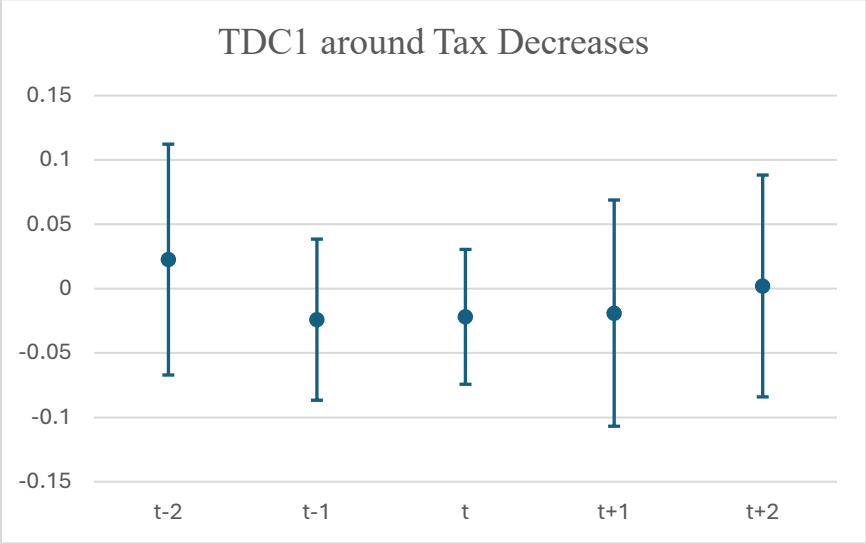


Table 1. Summary Statistics

This table presents summary statistics for state tax shocks. Panel A displays changes in the top personal income tax rates at the state levels. Panel B provides summary statistics at the level of CEO-firm-year on compensation, personal income tax rate changes and firm characteristics. The 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. 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

	US STATE Mean | Count		
	Mean Increase	Mean 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

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

Table 2. 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. TDC1 is total pay from the 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]
ΔLn(Assets)	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	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	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 3. Stacked DiD: CEO Compensation Responsiveness to State Personal Income Tax Changes

This table shows the effects of changes in personal US state income tax rates on CEO compensation, using a stacked DiD approach (Cengiz et al., 2019). For each large tax increase or decrease (at least 1%), a [-2, +2] stack window is used. States with any large changes (increases or decreases) at any point within a stack window are excluded (for example, if a state has large tax changes in both 2010 and 2012, both shocks are excluded from the test sample). CEOs of firms headquartered in states with large changes are in the treatment group. The remaining CEOs are in the control group. For each stack, 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 at the central year of the stack, and zero otherwise. $Post_1$ ($Post_2$) is an indicator variable for the first (second) year following a large tax shock. TDC1 is total pay from Execucomp. 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, where industries are defined using the Fama-French 49 classification. 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.

	(1)	(2)
VARIABLES	ΔLn(TDC1)	ΔLn(TDC1)
Tax Increase x $Post_1$	-0.010	
	[-0.30]	
Tax Increase x $Post_2$	0.073***	
	[4.11]	
Tax Decrease x $Post_1$		-0.015
		[-0.29]
Tax Decrease x $Post_2$		0.017
		[0.55]
ΔLn(Assets)	0.279***	0.263***
	[6.17]	[8.47]
ΔMTB	0.107***	0.084***
	[7.93]	[7.58]
ΔROA	0.516***	0.444***
	[4.69]	[4.51]
Observations	22,609	34,394
R-squared	0.271	0.272
CEO-Firm FE	Y	Y
Industry-Year FE	Y	Y

Table 4. Labor Market Channel: State Personal Income Tax and CEO Compensation

This table shows triangulating estimates of the effects of tax increases on CEO compensation. *Non Founder* is a dummy variable equal to one if a CEO is not a firm founder, and zero otherwise. *High # Firms in Ind* is a dummy variable equal to one if the number of firms in its industry is above bottom tercile in a year, and zero otherwise. *High # State Industry* is a dummy variable equal to one if a firm is in an industry (Fama-French 12) with firms in more than 35 states, i.e., Manufacturing (3), Business Equipment (6), Shops (9), and Others (12). *Tax Increase* is a dummy variable that equals one if a CEO's state personal income tax rate increases by at least one percentage point in a year and zero otherwise. The dependent variable is Δln(TDC1). The control variables are transformed Assets, MTB, and ROA, Δ denotes difference, and Ln(.) is the natural logarithm. Non Founder, High # Firms in Ind, and High # State Industry are lagged. All specifications include CEO-Firm fixed effects and Industry-Year fixed effects, where industries are defined using the Fama-French 49 classification. Robust standard errors are clustered at the state level. Variables are defined in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
		ΔLn(TDC1)	
	Non-Founder	# Firms in Industry	# States of Industry
Tax Increase$_{t-2}$	-0.062*	0.036*	0.015
	[-1.83]	[1.87]	[0.57]
Tax Increase$_{t-2}$ x Non Founder	0.155***		
	[4.64]		
Tax Increase$_{t-2}$ x High # Firms in Ind		0.120***	
		[2.70]	
Tax Increase$_{t-2}$ x High # State Industry			0.087**
			[2.33]
ΔLn(Assets)	0.318***	0.327***	0.328***
	[11.86]	[12.42]	[12.46]
ΔMTB	0.071***	0.074***	0.074***
	[9.42]	[9.58]	[9.61]
ΔROA	0.400***	0.393***	0.393***
	[6.06]	[5.89]	[5.89]
Observations	21,420	22,291	22,291
R-squared	0.202	0.196	0.196
CEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Table 5. Corporate Governance and the CEO Pay Response to State Tax Increases

This table shows the role of governance in the effects of tax increases on CEO compensation. *High Cooption* is a dummy variable equal to one if board cooption is above median in a year, and zero otherwise, where cooption is the fraction of directors appointed after the incumbent CEO assumed office (Coles, Daniel, and Naveen, 2014). *Low Block Ownership* is a dummy variable equal to one if block ownership is below median in a year, and zero otherwise, where block ownership is the aggregate fraction of shares held by shareholders owning at least 5% of a firm. *Tax Increase* is a dummy variable that equals one if a CEO's state personal income tax rate increases by at least one percentage point in a year and zero otherwise. 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 fixed effects and Industry-Year fixed effects, where industries are defined using the Fama-French 49 classification. Robust standard errors are clustered at the state level. Variables are defined in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1)	(2)
	ΔLn(TDC1)	
	Cooption	Block Ownership
Tax Increase$_{t-2}$	0.076*	0.057**
	[1.75]	[2.40]
Tax Increase$_{t-2}$ x High Cooption	-0.058	
	[-0.75]	
Tax Increase$_{t-2}$ x Low Block Ownership		-0.043
		[-1.04]
ΔLn(Assets)	0.249***	0.306***
	[5.24]	[9.41]
ΔMTB	0.063***	0.065***
	[5.53]	[9.16]
ΔROA	0.542***	0.431***
	[7.00]	[6.98]
Observations	13,761	18,363
R-squared	0.214	0.209
CEO-Firm FE	Y	Y
Industry-Year FE	Y	Y

Table 6. CEO Compensation Components and 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, where industries are defined using the Fama-French 49 classification. 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(NonEqIncent)	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)	0.027*	0.360***	0.315***	0.182***	0.386***
	[2.00]	[6.16]	[6.75]	[5.06]	[8.57]
ΔMTB	0.002	0.135***	0.179***	0.028	0.045***
	[1.33]	[8.16]	[6.35]	[1.59]	[4.32]
ΔROA	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(NonEqIncent)	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)	0.016	0.311***	0.326***	0.207***	0.408***
	[1.00]	[3.41]	[6.30]	[4.38]	[8.83]
ΔMTB	0.001	0.138***	0.168***	0.035	0.037***
	[0.87]	[7.43]	[5.91]	[1.57]	[3.16]
ΔROA	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. Elasticity of US CEO Compensation in the US Inverse 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 columns 1 and 2 we consider large tax rate changes 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. In column 3 the calculation of NOT_t considers all tax changes of any size. All specifications include CEO-Firm and Industry-Year fixed effects, where industries are defined using the Fama-French 49 classification. 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)	(3)
	Large (≥1%) State Tax Changes		All State Tax Changes
Variables	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)		0.327***	0.327***
		[12.42]	[12.41]
ΔMTB		0.074***	0.074***
		[9.55]	[9.57]
ΔROA		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 8. Elasticity of US CEO Compensation in the US Inverse Net-of-Tax Rate, Adjusted for SALT

This table reports the robustness tests for the elasticity of US CEO compensation in the net-of-personal-income-tax rate, accounting for changes in federal tax rules governing the deductibility of State and Local Taxes (SALT). The dependent variable is transformed CEO total compensation, Δln(TDC1), and control variables include Assets, MTB, and ROA. Δ denotes difference and Ln(.) is the natural logarithm. NOT_t is the after-tax multiple for pay, which equals to $(1-\tau_{m,f,t})(1-\tau_{m,s,t})$ in or before 2017 and $(1-\tau_{m,f,t}-\tau_{m,s,t})$ in years after 2017 for CEO m in year t (f (s) denotes federal (state)). We consider large tax rate changes 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, where industries are defined using the Fama-French 49 classification. 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	ΔLn(TDC1)	ΔLn(TDC1)
Ln(NOT_{t-2}/NOT_{t-1})	-0.102	-0.227
	[-0.21]	[-0.49]
Ln(NOT_{t-3}/NOT_{t-2})	1.159***	0.835**
	[3.07]	[1.98]
ΔLn(Assets)		0.327***
		[12.40]
ΔMTB		0.074***
		[9.55]
ΔROA		0.393***
		[5.88]
Observations	22,575	22,291
R-squared	0.177	0.196
CEO-Firm FE	Y	Y
Industry-Year FE	Y	Y

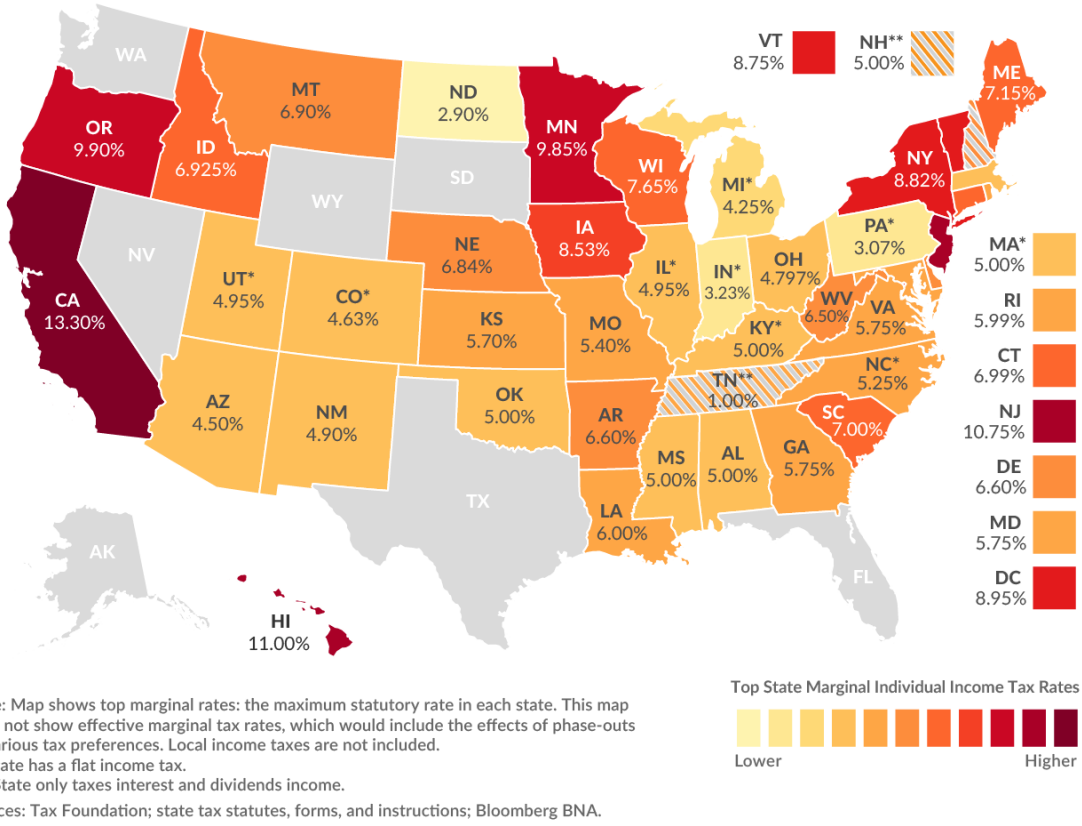
Appendix 1: Variable Definitions

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
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" rate, 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
Population	the total state population within a specific year
MTB	market value of equity plus book value of debt divided by the sum of the book values of debt and equity
ROA	net income scaled by total assets
SCash	the total cash holdings 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 (in some instances only if the tax rate increase is at least as large as one percentage point), and zero otherwise
Tax Decrease	a dummy variable equal to one if a CEO experienced a personal income tax rate decrease (in some instances only if the tax rate decrease is at least as large as 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 A1. Top Marginal State Personal Income Tax Rates in the United States

This figure reports US top state marginal personal income tax rates in 2020.



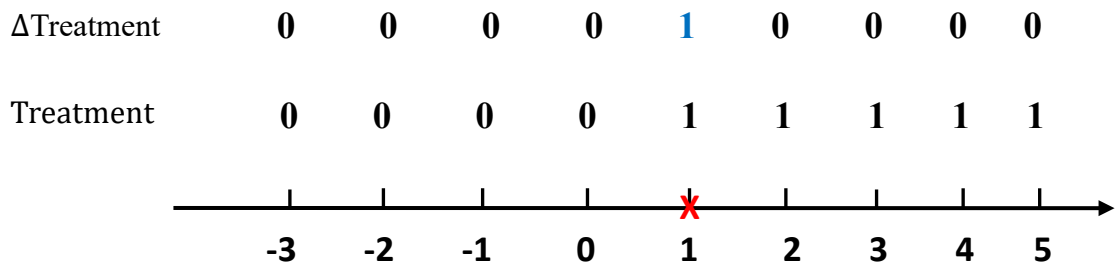
Note: Map shows top marginal rates: the maximum statutory rate in each state. This map does not show effective marginal tax rates, which would include the effects of phase-outs of various tax preferences. Local income taxes are not included.
(*) State has a flat income tax.
(**) State only taxes interest and dividends income.

Sources: Tax Foundation; state tax statutes, forms, and instructions; Bloomberg BNA.

See https://taxfoundation.org/data/all/state/state-individual-income-tax-rates-and-brackets-for-2020/.

Figure A2. 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.



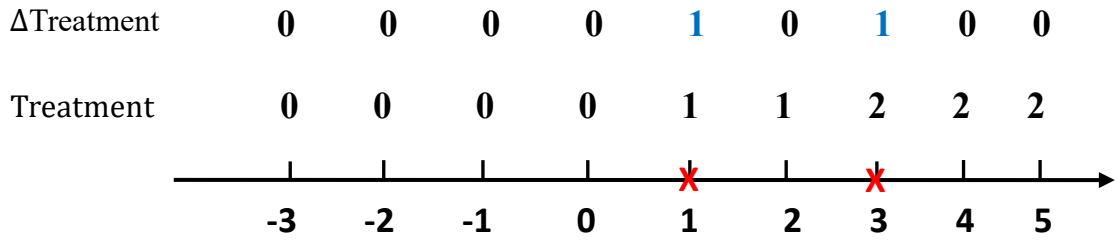


Figure A3. Examples for Neighbor States Without Tax Shocks

This figure shows examples for neighboring control states for treated states with tax increases or decreases. 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 the neighbor state test 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.

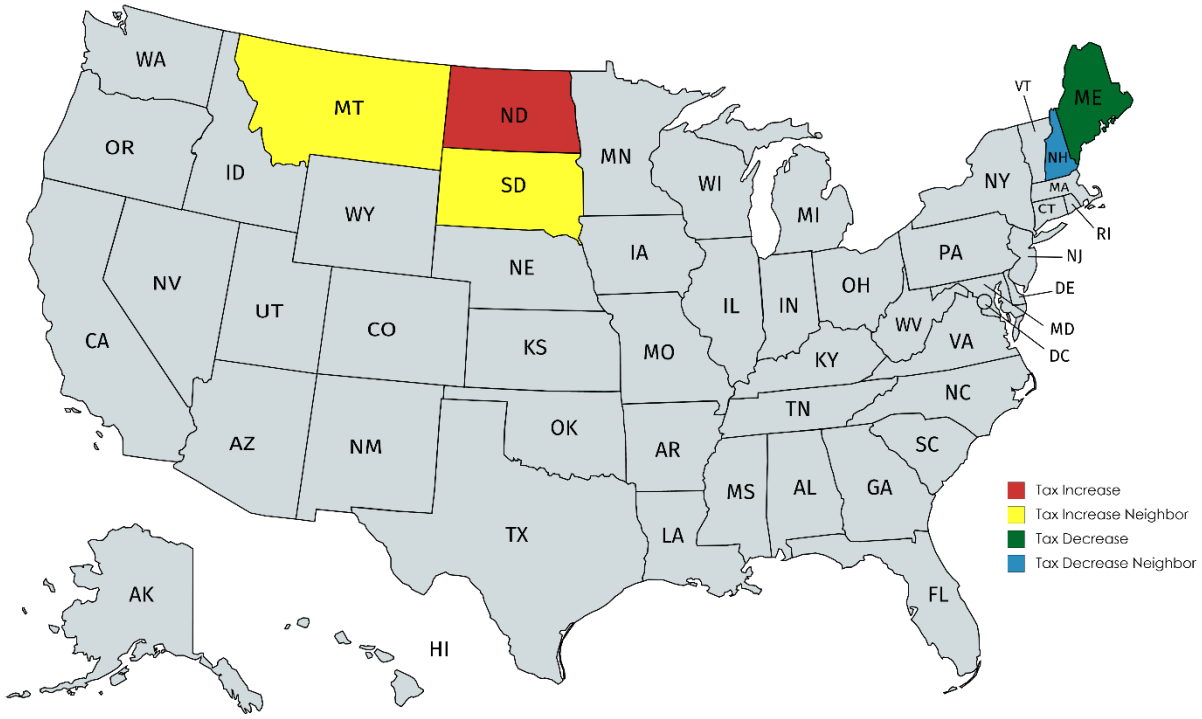
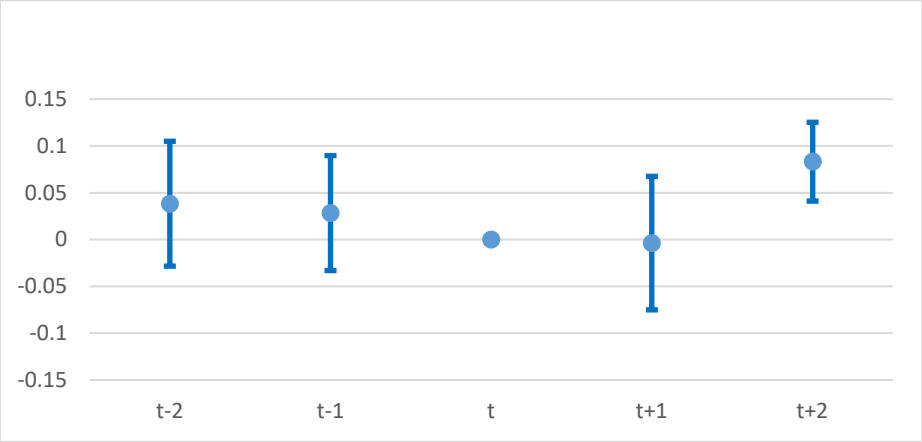


Figure A4. Pre-trends for Stacked DiD Analysis: Personal Income Tax Shocks and CEO Compensation

This figure illustrates the effect of US state personal income tax rates on CEO compensation. Using a stacked DiD approach, ΔLn(TDC1) is regressed on yearly indicator variables (relative to the year of a tax shock), and CEO-firm and industry-year fixed effects included. The y-axis plots the coefficient estimates on each yearly indicator variable. The x-axis shows the year relative to the shock to state personal income tax rates. Year *t* is the benchmark year. The sample is at the CEO-firm-year level. Treated firms are those headquartered in states with large changes in personal income tax rates (at least 1%), and control firms are those headquartered in remaining states. The error bars illustrate the 90% confidence intervals of the coefficient estimates. The confidence intervals are based on standard errors clustered at the state level.

Panel A. Tax Increases



Panel B. Tax Decreases

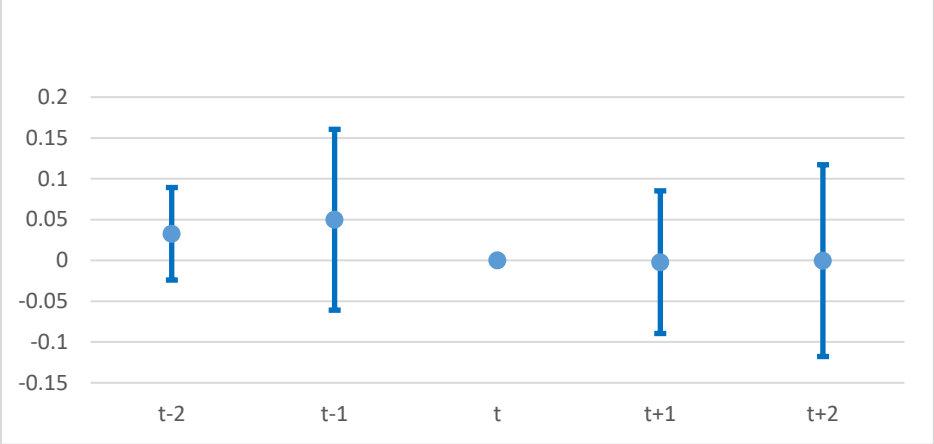
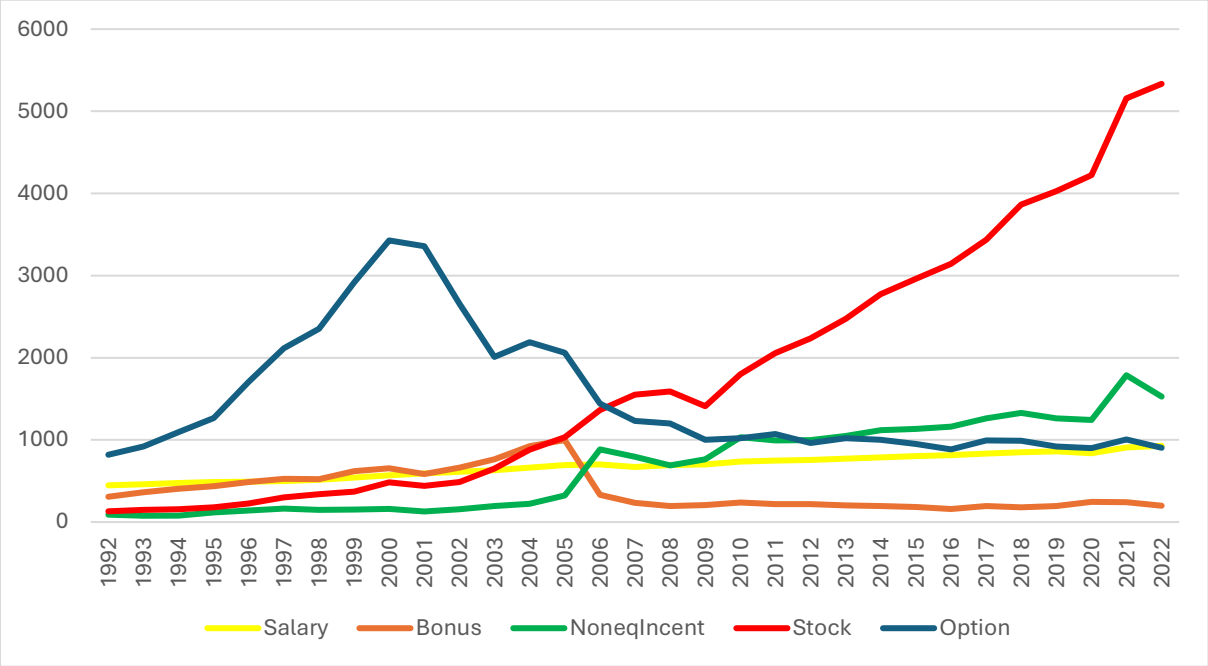


Figure A5. Components of CEO Compensation

This figure illustrates the yearly average of the components of CEO compensation between 1992 and 2022 inclusive. Panel A reports the level of components, which include salary, bonus, non-equity incentives, stock, and options in thousands of US dollars. Panel B shows the fraction of each component. The data are from Execucomp.

Panel A: Level of Components



Panel B: Share of Components

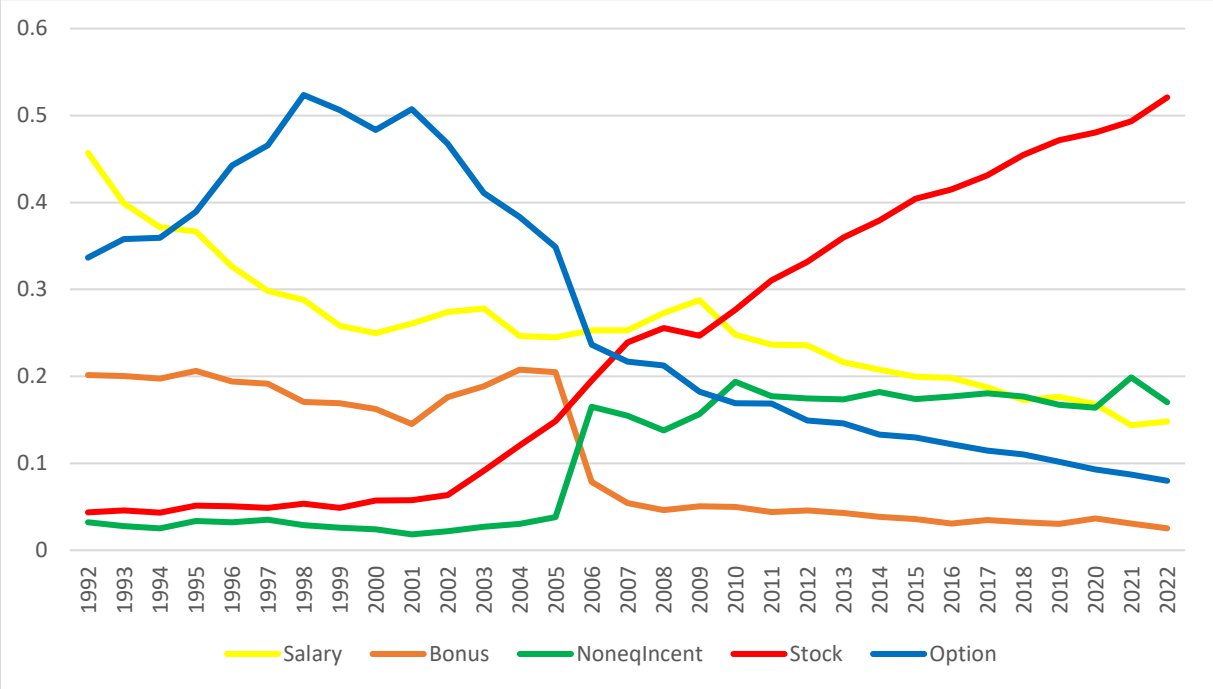


Table A1. Changes in Top Personal Income Tax Rates at the Federal Level

This table presents the means and counts for changes in the top personal income tax rates at the federal level. The sample period is 1992 – 2022 inclusive.

	US FEDERAL Mean | Count		
	Mean Increase	Mean Decrease	Both
Large	6.60% | 2	-3.10% | 2	NA | 4
Small	NA	-0.50% | 2	NA | 2
Total	6.60% | 2	-1.80% | 4	NA | 6

Table A2. 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 a NEO's state personal income tax rate increases (decreases) by at least one percentage point in a year and zero otherwise. TDC1 is total pay from 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, where industries are defined using the Fama-French 49 classification. 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.

	(1)	(2)	(3)
VARIABLES		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)	0.250***	0.250***	0.250***
	[11.51]	[11.40]	[11.38]
ΔMTB	0.063***	0.063***	0.063***
	[8.69]	[8.73]	[8.72]
ΔROA	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 A3. 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 prior 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 no less 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 1998 to 2020. 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)	0.188	-0.096
	[1.22]	[-0.83]
ΔLn(Population)	0.003	-0.201
	[0.01]	[-0.58]
ΔDemocrat Gov	0.014	-0.028*
	[1.03]	[-1.71]
ΔUnemployment	0.003	-0.050
	[0.10]	[-1.38]
ΔLn(SDebt)	0.025	0.056
	[0.52]	[1.31]
ΔLn(Tax Revenue)	-0.088	0.015
	[-1.64]	[0.77]
ΔLn(SCash)	-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 A4. CEO Pay and State Tax Shocks: Include State-level Control Variables

This table shows the robustness tests for the effects of changes in personal US state income tax rates on CEO compensation, including state-level control variables. 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. TDC1 is total pay from the Execucomp database. The dependent variable is Δln(TDC1) and the control variables are transformed Assets, MTB, ROA, and state level variables, 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.

	(1)	(2)
VARIABLES	ΔLn(TDC1)	ΔLn(TDC1)
Tax Increase$_{t-1}$	0.012	0.012
	[0.60]	[0.58]
Tax Increase$_{t-2}$	0.053***	0.053***
	[3.90]	[3.97]
Tax Decrease$_{t-1}$	0.025	0.024
	[0.83]	[0.77]
Tax Decrease$_{t-2}$	0.011	0.010
	[0.36]	[0.31]
ΔLn(Assets)	0.268***	0.198***
	[9.59]	[6.22]
ΔMTB	0.077***	0.075***
	[8.46]	[8.67]
ΔROA	0.386***	0.309***
	[5.49]	[4.03]
ΔLog(StateGDP)	0.551**	0.521**
	[2.56]	[2.43]
ΔDem Governor	0.416	0.409
	[0.61]	[0.62]
ΔLog(Unemployment)	-0.009	-0.008
	[-0.75]	[-0.64]
ΔLog(StatePopulation)	0.093	0.099
	[1.51]	[1.63]
ΔLog(StateDebt)		-0.053
		[-1.11]
ΔLog(StateRevenue)		0.169***
		[5.27]
ΔLog(StateCash)		0.017
		[0.39]
Observations	16,308	16,308
R-squared	0.192	0.194
CEO-Firm FE	Y	Y
Industry-Year FE	Y	Y

Table A5. CEO Pay and State Tax Shocks: A Narrative Approach

This table shows the effects of changes in personal income tax rates on CEO compensation. We define exogenous state tax shocks following the narrative approach by Romer and Romer (2010) and Giroud and Rauh (2019), and only these shocks are included in the test sample. Specifically, 38 (out of 46) large tax changes in our sample are identified as exogenous tax changes. *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. TDC1 is total pay from Execucomp. 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, where industries are defined using the Fama-French 49 classification. 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]
ΔLn(Assets)	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	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	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 A6. CEO Pay and 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 without tax rate changes. Column 2 (5) includes tax-decrease treated states and neighboring control states without tax rate changes. Column 3 (6) includes tax-increase treated states, tax-decrease treated states and neighboring control states to both tax-increase and tax-decrease states without tax rate changes. TDC1 is total pay from 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, where industries are defined using the Fama-French 49 classification. 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$_{t-1}$	0.006		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)	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	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	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 A7. Distance to State Border, Tax Increases, and CEO Compensation

This table shows the effects of changes in personal income tax rates on CEO compensation. *Tax Increase* is a dummy variable that equals one if a 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. TDC1 is total pay from 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, where industries are defined using the Fama-French 49 classification. 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.

	(1) Base Control Sample	(2) Spotless Control Sample
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)	0.322***	0.329***
	[12.71]	[11.04]
ΔMTB	0.072***	0.069***
	[7.45]	[6.42]
ΔROA	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 A8. Placebo Test

This table reports the results of placebo tests of the effect of US state personal income tax shocks on CEO pay. We randomly assign tax increases and decreases to CEOs, setting the mean of the increases and decreases equal to the actual sample mean at the CEO-year level, and regress ΔLn(TDC1) on the simulated tax shocks. *Tax Increase (Tax* Decrease) is a dummy variable that equals one if a CEO's allocated personal income tax rate increases (decreases) by at least one percentage point in a year and zero otherwise. 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, where industries are defined using the Fama-French 49 classification. 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.

	(1)	(2)	(3)
VARIABLES	ΔLn(TDC1)	ΔLn(TDC1)	ΔLn(TDC1)
Tax Increase$_{t-1}$	-0.010		-0.009
	[-0.52]		[-0.50]
Tax Increase$_{t-2}$	0.008		0.008
	[0.25]		[0.26]
Tax Decrease$_{t-1}$		0.028	0.028
		[0.68]	[0.67]
Tax Decrease$_{t-2}$		0.017	0.017
		[0.39]	[0.39]
ΔLn(Assets)	0.327***	0.327***	0.327***
	[12.43]	[12.38]	[12.42]
ΔMTB	0.074***	0.074***	0.074***
	[9.56]	[9.55]	[9.53]
ΔROA	0.394***	0.394***	0.394***
	[5.87]	[5.88]	[5.87]
Observations	22,291	22,291	22,291
R-squared	0.196	0.196	0.196
CEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Table A9. Robustness Tests: Corporate Income Taxes and Additional Firm Characteristics

This table reports the robustness tests for the effects of US state personal income tax on CEO compensation, controlling for corporate income taxes and additional firm characteristics. Panel A drops firms headquartered in states with large shocks (no less than one percentage point) to state-level corporate income tax rates in any year of the sample. Panel B controls for state corporate income tax rates (top bracket) and additional firm characteristics including Debt/Assets, stock returns, and return volatilities. 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. TDC1 is total pay from Execucomp. State corporate income tax data is from Serrato and Zidar (2018). The dependent variable is Δln(TDC1) and the baseline 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, where industries are defined using the Fama-French 49 classification. 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. Drop Large Shocks to State-level Corporate Income Tax Rates

VARIABLES	(1) ΔLn(TDC1)	(2) ΔLn(TDC1)	(3) ΔLn(TDC1)
Tax Increase$_{t-1}$	0.038		0.039
	[1.63]		[1.60]
Tax Increase$_{t-2}$	0.072***		0.075***
	[4.01]		[4.25]
Tax Decrease$_{t-1}$		-0.021	-0.012
		[-0.38]	[-0.21]
Tax Decrease$_{t-2}$		0.045	0.057
		[0.79]	[1.05]
ΔLn(Assets)	0.322***	0.320***	0.322***
	[10.43]	[10.34]	[10.41]
ΔMTB	0.072***	0.072***	0.072***
	[8.25]	[8.23]	[8.22]
ΔROA	0.287***	0.287***	0.288***
	[6.55]	[6.55]	[6.54]
Observations	14,405	14,405	14,405
R-squared	0.218	0.218	0.218
CEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Panel B. Controlling for Corporate Income Tax Rates and Additional Firm Characteristics

VARIABLES	(1)	(2) ΔLn(TDC1)	(3)
Tax Increase x $Post_1$	0.019		0.020
	[1.12]		[1.18]
Tax Increase x $Post_2$	0.049***		0.049***
	[3.84]		[3.83]
Tax Decrease x $Post_1$		0.013	0.013
		[0.56]	[0.55]
Tax Decrease x $Post_2$		0.013	0.017
		[0.45]	[0.60]
ΔLn(Assets)	0.394***	0.393***	0.394***
	[19.33]	[19.12]	[19.39]
ΔMTB	0.083***	0.083***	0.083***
	[8.90]	[8.89]	[8.91]
ΔROA	0.299***	0.300***	0.299***
	[5.26]	[5.27]	[5.27]
ΔDebt/Assets	-0.425***	-0.423***	-0.424***
	[-6.99]	[-6.97]	[-6.98]
ΔRet	-0.009	-0.009	-0.009
	[-0.80]	[-0.79]	[-0.80]
ΔVolatility	0.117	0.123	0.120
	[0.22]	[0.23]	[0.23]
ΔCorpRate	0.010	0.011	0.011
	[1.48]	[1.41]	[1.49]
Observations	19,609	19,609	19,609
R-squared	0.131	0.131	0.131
CEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Table A10. CEO Compensation Responsiveness to State Personal Income Tax Changes: Drop COVID-19 Period and other Recession Years

This table reports the robustness tests for the effects of US state personal income tax on CEO compensation, dropping the years during COVID-19 and other recession years (2001, 2007, 2008, 2009, 2020, 2021, and 2022). The recession years follow the business cycle dating defined by NBER (https://www.nber.org/research/business-cycle-dating). 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. TDC1 is total pay from Execucomp. 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, where industries are defined using the Fama-French 49 classifications. 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$_{t-1}$	-0.003		-0.002
	[-0.17]		[-0.10]
Tax Increase$_{t-2}$	0.076***		0.078***
	[3.81]		[3.88]
Tax Decrease$_{t-1}$		-0.007	-0.010
		[-0.21]	[-0.34]
Tax Decrease$_{t-2}$		0.032	0.038
		[0.74]	[0.88]
ΔLn(Assets)	0.340***	0.340***	0.340***
	[14.03]	[13.94]	[13.91]
ΔMTB	0.090***	0.090***	0.090***
	[10.12]	[10.14]	[10.10]
ΔROA	0.346***	0.347***	0.346***
	[4.40]	[4.41]	[4.42]
Observations	16,883	16,883	16,883
R-squared	0.217	0.217	0.218
CEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Table A11. Stacked DiD: CEO Pay and State Tax Shocks (A Narrative Approach)

This table shows the effects of changes in personal income tax rates on CEO compensation using a stacked DiD approach (Cengiz et al., 2019). We define exogenous state tax shocks following the narrative approach by Romer and Romer (2010) and Giroud and Rauh (2019), and only these shocks are included in the test sample. For each large tax increase or decrease (at least 1%), a [-2, +2] stack window is used. States with any large changes (increases or decreases) at any point within a stack window are excluded (for example, if a state has large tax changes in both 2010 and 2012, both shocks are excluded from the test sample). CEOs of firms headquartered in states with large changes are in the treatment group. The remaining CEOs are in the control group. For each stack, 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 at the central year of the stack, and zero otherwise. $Post_1$ ($Post_2$) is an indicator variable for the first (second) year following a large tax shock. TDC1 is total pay from Execucomp. 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, where industries are defined using the Fama-French 49 classification. 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.

	(1)	(2)
VARIABLES	ΔLn(TDC1)	ΔLn(TDC1)
Tax Increase x $Post_1$	0.001	
	[0.04]	
Tax Increase x $Post_2$	0.084***	
	[5.25]	
Tax Decrease x $Post_1$		0.004
		[0.08]
Tax Decrease x $Post_2$		0.005
		[0.13]
ΔLn(Assets)	0.276***	0.217***
	[6.03]	[6.90]
ΔMTB	0.107***	0.086***
	[7.88]	[5.84]
ΔROA	0.517***	0.419***
	[4.67]	[4.27]
Observations	22,491	27,044
R-squared	0.271	0.268
CEO-Firm FE	Y	Y
Industry-Year FE	Y	Y

Table A12. Stacked DiD: CEO Pay and State Tax Shocks Using Neighboring Control States

This table shows the effects of changes in personal income tax rates on CEO compensation using a stacked DiD approach (Cengiz et al., 2019). Only neighboring control states are included in the test sample. For each large tax increase or decrease (at least 1%), a [-2, +2] stack window is used. States with any large changes (increases or decreases) at any point within a stack window are excluded (for example, if a state has large tax changes in both 2010 and 2012, both shocks are excluded from the test sample). CEOs of firms headquartered in states with large changes are in the treatment group. The remaining CEOs are in the control group. For each stack, 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 at the central year of the stack, and zero otherwise. $Post_1$ ($Post_2$) is an indicator variable for the first (second) year following a large tax shock. TDC1 is total pay from Execucomp. 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, where industries are defined using the Fama-French 49 classification. 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.

	(1)	(2)
VARIABLES	ΔLn(TDC1)	ΔLn(TDC1)
Tax Increase x $Post_1$	-0.013	
	[-0.39]	
Tax Increase x $Post_2$	0.058**	
	[2.48]	
Tax Decrease x $Post_1$		-0.043
		[-0.81]
Tax Decrease x $Post_2$		-0.022
		[-0.52]
ΔLn(Assets)	0.281***	0.268***
	[6.57]	[10.83]
ΔMTB	0.105***	0.086***
	[6.17]	[6.55]
ΔROA	0.463***	0.460***
	[2.84]	[4.25]
Observations	12,368	27,886
R-squared	0.310	0.288
CEO-Firm FE	Y	Y
Industry-Year FE	Y	Y

Table A13. CEO Compensation Responsiveness to State Personal Income Tax Changes: Continuous Treatment

This table reports the robustness tests for the effects of US state personal income tax on CEO compensation using continuous treatment values, per Callaway et al (2024). *Continuous Tax Increase* (*Decrease*) is the CEO's state personal income tax rate increase (decrease), in percent, when the magnitude of that change was at least one percent. TDC1 is total pay from Execucomp. 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, where industries are defined using the Fama-French 49 classifications. 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)
Continuous Tax Increase$_{t-2}$	0.030***		0.031***
	[3.82]		[3.95]
Continuous Tax Decrease$_{t-2}$		-0.013	-0.017
		[-0.59]	[-0.77]
ΔLn(Assets)	0.327***	0.327***	0.327***
	[12.38]	[12.36]	[12.35]
ΔMTB	0.074***	0.074***	0.074***
	[9.58]	[9.58]	[9.58]
ΔROA	0.393***	0.394***	0.393***
	[5.89]	[5.89]	[5.90]
Observations	22,291	22,291	22,291
R-squared	0.196	0.196	0.196
CEO-Firm FE	Y	Y	Y
Industry-Year FE	Y	Y	Y

Table A14. Elasticity of US CEO Compensation in the Federal Net-of-Tax Rate

This table shows the elasticity of US CEO compensation in the net-of-personal-income-tax rate following the framework by Frydman and Molloy (2011). 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 $(1-\tau_{m,f,t})$ for CEO m in year t (f denotes federal). Columns 1 and 2 do not include fixed effects. Columns 3 and 4 include firm and 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.

	(1)	(2)	(3)	(4)
	US Federal Tax Changes Only			
Variables	ΔLn(TDC1)			
Ln(NOT_{t-2}/ NOT_{t-1})	-0.231	-0.238	-0.047	-0.076
	[-1.43]	[-1.47]	[-0.07]	[-0.12]
Ln(Initial Pay)		-0.002		0.016**
		[-0.53]		[2.11]
ΔLn(Assets)	0.375***	0.373***	0.346***	0.347***
	[16.82]	[16.63]	[16.92]	[16.95]
ΔMTB	0.073***	0.073***	0.075***	0.075***
	[11.74]	[11.73]	[14.36]	[14.42]
ΔROA	0.428***	0.428***	0.392***	0.390***
	[8.80]	[8.79]	[9.38]	[9.32]
Observations	23,384	23,382	23,187	23,185
R-squared	0.035	0.035	0.090	0.090
Firm FE	N	N	Y	Y
Year FE	N	N	Y	Y

Table A15. CEO Turnover Following State Tax Increases

This table shows the effects of state tax increases and subsequent CEO pay raises on CEO turnover. *Voluntary Turnover* is equal to one if there was a turnover in a given firm-year that was not forced (forced turnover data is from Peters and Wagner (2014) and Jenter and Kanaan (2015). *PayRaise* is equal to one if a CEO received an increase in pay within 2 years of a state tax increase and zero otherwise. The sample includes CEOs experiencing large state personal income tax increases (no less than one percentage point) in a year. All specifications include firm and year fixed effects. Robust standard errors are clustered at the state level. Variables are defined in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Voluntary Turnover	(2) Voluntary Turnover
PayRaise	-0.049**	-0.049**
	[-2.03]	[-2.03]
Log(Assets)	-0.006	-0.006
	[-0.59]	[-0.57]
MTB	-0.005	-0.005
	[-0.32]	[-0.33]
ROA	-0.321***	-0.328***
	[-3.52]	[-3.51]
Return	-0.023	-0.023
	[-1.15]	[-1.15]
Debt/Assets		-0.030
		[-0.57]
Observations	1,501	1,501
R-squared	0.548	0.548
Firm FE	Y	Y
Year FE	Y	Y

Table A16. Firm Performance and CEO Pay Raises Following Large Personal Income Tax Increases

This table presents univariate and multivariate evidence on the relationship between firm performance and CEO pay raises following personal tax increases. All CEOs in this subsample faced a large personal income tax increase in year *t*-3. We split the subsample based on whether the CEO received a pay increase. We measure firm performance in year *t*. Panel A presents univariate tests on firm performance split based on CEOs who received (or did not receive) a pay increase following a personal income tax rate increase (at least one percentage point). The *p*-value is for the *t*-test of the equal means of the performance measure between the two groups. Panel B presents multivariate tests of firm performance on CEO pay raises. The CEO pay raise dummy, *Pay Raise*, is equal to one for CEOs who received a pay increase within two years of a personal income tax increase and zero for those who did not. All variables except the pay raise dummy are in first difference in both panels. All specifications include firm fixed effects and year fixed effects. Robust standard errors are clustered at the state level. Variables are defined in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Univariate Comparison

	ΔROA	ΔStock Return
Pay Raise$_{t-1}$	0.004	0.065
No Pay Raise$_{t-1}$	-0.010	0.005
p-value	0.001	0.001

Panel B: Multivariate Model

	(1)	(2)
VARIABLES	ΔROA	ΔStock Return
Pay Raise$_{t-1}$	0.014**	0.116***
	[2.00]	[3.13]
Log(Assets $_{t-1}$)	0.011	-0.463***
	[0.33]	[-3.76]
ΔMTB$_{t-1}$	0.008*	0
	[1.88]	[0.15]
Cash $_{t-1}$	0.158***	0.738***
	[2.93]	[3.19]
Debt $_{t-1}$	0.148***	0.827***
	[2.80]	[4.14]
R&D $_{t-1}$	0.371	-0.484
	[1.55]	[-0.61]
ROA $_{t-1}$	-0.434***	
	[-3.52]	
ROA $_{t-2}$	-0.207	
	[-1.56]	
Return $_{t-1}$		-0.682***
		[-13.89]
Return $_{t-2}$		-0.232***
		[-4.35]
Observations	943	920
R-squared	0.551	0.673
Firm FE	Y	Y
Year FE	Y	Y

Appendix 3

Preemptive Locational Choice

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 costs of relocating are low, then such a threat is credible. Locational considerations, however, potentially have a countervailing effect. Some executives may already be taxed in another state or can move to another state that differs from the firm's domicile and was not treated with an income tax shock but still serves as CEO. Some reciprocal state tax agreements can make this feasible.[26,27] Such a prior preemptive locational choice would eliminate 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. We argue that locational choices that insulate executives from state tax shocks are unlikely to significantly attenuate our estimates of the sensitivity of executive pay to changes in the personal state income tax rate.

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[26] 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 Jersey (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 locate in a low-tax tax domicile and to source employment income in a low-tax state. Not surprisingly, after nearly forty years, in September 2016 New Jersey Governor Chris Christie terminated the New Jersey agreement with Pennsylvania, effective January 1, 2017 (though the Pennsylvania side remains). 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.

[27] On the other hand, some 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.

First, there are few 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 taxes in the work state.[28] Moreover, one-way agreements are infrequent. In 2016 there were 64 ordered state pairs with an asymmetric one-way arrangement, which was only 2.51% of the 2,550 possible one-way arrangements among 51 jurisdictions, the 50 states and Washington, DC. States have erected additional barriers to the locational avoidance of state income tax.[29]

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.

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

[29] 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.

Third, as did Duchin and Sosyura (2021), we obtain the CEO residential address data used by Bernile, Bhagwat, and Yonker (2018).[30] 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, Duchin and Sosyura (2021) report that long-distance CEOs do not perform as well as local CEOs. One reason for why there are so few long-distance CEOs is that it is likely that some firms require their CEO to be local.

In summary, 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.

[30] We thank Scott Yonker for sharing data on executives' home addresses.

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