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Executive compensation, individual-level tax rates, and insider trading profits[☆]

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ARTICLE INFO

ABSTRACT

We examine whether individual-level taxes affect executives' propensity to use nonpublic information in insider trades. We predict and find a positive relation between abnormal insider trading profitability and income tax rates. Using plausibly exogenous variation in state income tax rates, we estimate that the average executive uses insider trading profits to offset between 12.2% and 19.6% of the effect that income taxes have on their net compensation. We show that the sensitivity of these profits to tax rates varies predictably with the executives' compensation and shareholdings, firm monitoring effectiveness, and information asymmetry between insiders and outside investors. We also demonstrate a positive association between SEC enforcement actions and tax rates, suggesting that tax-rate-driven changes in abnormal trading profits expose insiders to legal risk. We find that insider trading volume exhibits little sensitivity to tax rates. Our findings show that income taxes affect executives' tendency to use private information in their trades.

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1. Introduction

Changes in individual tax rates represent exogenous shocks to executives' net compensation. Executives typically bear the costs and benefits of these shocks, because firms make, at best, modest adjustments to their compensation plans following tax rate changes. For example, Frydman and Molloy (2011) examine the responsiveness of executive compensation to changes in individual tax rates between 1946 and 2005 and find little relation between the two (see also Goolsbee, 2000; Hall and

Liebman, 2000). Given that executive compensation is insensitive to tax rates, executives may choose to counteract tax effects by adjusting their insider trading profits through the use of private information. Such an adjustment would be consistent with studies that suggest that insider trading profits substitute for other forms of compensation (e.g., Roulstone, 2003; Henderson, 2011; Denis and Xu, 2013).

We investigate the effect of individual tax rates on abnormal insider trading profitability. We predict that higher income tax rates incentivize executives to generate higher insider trading profits to compensate for the decrease in their after-tax compensation. We also conjecture that these incentives vary with several factors, including executives' level of compensation, shareholdings, and private information, and firms' effectiveness in monitoring insider transactions.

In our main empirical tests, we examine the relationship between the abnormal profitability of insider transactions and state income tax rates between 2000 and 2019. We define the abnormal profitability of an insider trade as the abnormal stock return following the transaction, following Jagolinzer et al. (2011). We analyze a sample with transactions of all executives (i.e., chief officers, presidents, vice presidents, and general counsel) and a subsample consisting of only CEOs. We focus on state tax rates because they vary across insiders and because the staggered nature of changes in state tax rates mitigates the concern that concurrent macroeconomic changes might explain our results.

We document that abnormal profitability for insider sales, insider purchases, and net insider transactions is significantly higher under higher state tax rate regimes. The results are statistically and economically significant in both the all-executives sample and the CEO subsample. In terms of economic magnitude, we estimate that trading profits from net insider transactions offset 19.6% (12.2%) of the effect of a change in tax rates on compensation for the median executive (CEO).

In cross-sectional tests, we examine several factors that can influence the strength of the relationship between income tax rates and the abnormal profitability of insider trading. First, we find that insider trading profits are more sensitive to income tax rates among insiders with low compensation, for whom the marginal utility of compensation likely is higher. Second, insiders can increase their trading profits by conducting larger trades or by using more private information to increase profit per share. Consistent with this substitutability, we find that abnormal trading profits are more sensitive to income tax rates when insiders have smaller shareholdings. Third, we examine the role of the effectiveness of firm monitoring using internal control weaknesses and firms' tendency to incur penalties for violating regulations as proxies for monitoring and, to some extent, corporate ethics. We find that insider trading profitability is lower and more sensitive to tax rates in firms with strong monitoring. Lastly, we document that insider trading profitability is more sensitive to tax rates when insiders possess more private information and hence have more flexibility in how they use this information.

We confirm our main findings with three additional tests. First, we conduct a difference-in-differences analysis around large (i.e., two percent or higher) state tax rate changes, which allows us to improve identification at the cost of sample size. In support of our main analyses, we find that, relative to insiders who do not experience any changes in tax rates, insiders who experience an increase (decrease) in tax rates significantly increase (decrease) their abnormal trading profits. The effect size is comparable to those in our main analyses, as we estimate that insider trading profits offset 24.8% (16.8%) of the effect of a change in tax rates for median executive (CEO) compensation.

Second, we examine abnormal insider trading profitability around the enactment of the American Taxpayer Relief Act of 2013 (hereafter ATRA), which led to significant increases in federal income and capital gains tax rates. Unlike income taxes, capital gains taxes *disincentivize* the use of private information in insider trades because they reduce net trade profits and, thus, the benefit from insider trading. Nevertheless, capital gains taxes are a secondary consideration for most executives because most executive compensation is subject to income taxes, per the tax code (Jin and Kothari, 2008; Armstrong et al., 2019). Consistent with these points, we find a significant increase in abnormal trading profits after ATRA was enacted, except for executives who have a larger portion of their compensation subject to capital gains taxation. Third, we run our analyses using an alternative measure of abnormal insider trading profits based on the work of Skaife et al. (2013), who focus on total annual insider trading profits as a percentage of a firm's market capitalization. We find that our inferences remain similar using this alternative measure.

In additional analyses, we extend our findings in two ways. First, we examine whether insider trading volume is associated with tax rates. Insiders can increase trading profits by increasing either their profit per share or trade size. Our main findings provide evidence of the former mechanism being used. We do not find a strong relation between insider trading volume and tax rates, suggesting that insiders adjust their trading profits primarily by increasing their profits per share. Second, we examine whether tax rate-driven changes in insider trading have legal consequences. Using SEC enforcement actions against insider trading as a proxy for legal risk, we document that each percentage point change in state income tax rates is associated with a five percent change in SEC enforcement actions. This finding shows that tax-driven changes in abnormal insider trading affect insiders' exposure to legal risk.

Taxation and its effects on equity markets have long been a topic of political debate and academic research. A tenet of these discussions is that taxes distort investor behavior (e.g., Odean, 1998; Ivkovic, Poterba, and Weisbenner, 2005; Grinblatt and Moskowitz, 2004; Sialm, 2009). We contribute to this debate by demonstrating an unintended consequence of taxes on insider trading. Our research suggests that policies that lead to higher income taxes increase executives' incentives to trade on private information and extract profits at the expense of less informed shareholders. Capital gains taxes have the opposite effect. However, this effect is less pronounced because a relatively small portion of executive compensation is subject to these taxes. Our study, therefore, adds to the work examining the optimal taxation of executives by highlighting the spillover effects of taxes (e.g., Diamond and Saez, 2011; Ales and Sleet, 2016).

Our study also adds to the literature on the sensitivity of executive compensation to individual tax rates. Our findings suggest that executives' ability to adjust insider trading profitability can help explain the unresponsiveness of executive compensation to tax rates, as documented in the literature.[1] These adjustments may be optimal from the firm perspective as well. Theory suggests that executives are compensated in part for the risk of holding a concentrated position in their firm's shares (Lambert et al., 1991; Hall and Murphy, 2002). Since an increase in tax rates reduces such after-tax compensation, firms may find it optimal to relax their monitoring of insider trades to encourage a reduction in ownership.

Our study contributes to the literature on the determinants of insider trading profits. Studies have identified various personal characteristics (Jia et al., 2014; Davidson et al., 2015) and firm characteristics (Frankel and Li, 2004; Aboody et al., 2005) associated with insider trading profitability. We show that individual tax rates also influence insider trading incentives. The time-varying and systemic nature of tax rates suggests that they contribute to variation in insider trading profitability over time and should therefore be considered in the analyses of insider trading.

2. Background information and hypothesis development

2.1. Taxation of executive compensation

In the United States, executive compensation is taxed as ordinary income at the time it is received (salary, bonus, and long-term incentive plans), vested (restricted stock), or exercised (stock options and stock appreciation rights). Thus, *all forms* of executive compensation are subject to individual income taxes.[2] In addition, for stock grants (nonqualifying stock options), any appreciation in value between the vesting (exercise) date and sales date is subject to ordinary income taxes if the shares are held for less than 12 months. If the shares are held longer, their appreciation is subject to long-term capital gains taxes.[3] Given these features of the tax code, our analyses focus on income taxes rather than capital gains taxes. We discuss the implications of capital gains tax rates and conduct supporting analyses in Section 5.3.

2.2. Hypothesis development

Exogenous shocks to executive compensation can distort executives' incentives and prompt a renegotiation of compensation contracts (e.g., Göx, 2008; Bénabou and Tirole, 2016). If renegotiation is infeasible, then executives can adjust their compensation through their hidden pay (possibly at their firm's discretion) (Seyhun, 1992).

A change in individual tax rates is an exogenous shock to executive compensation that, based on prior findings, does not lead to widespread renegotiations of compensation contracts. Frydman and Molloy (2011) examine executive compensation from 1946 to 2005 and find little response of salaries, stock options, and bonuses to changes in individual tax rates. Similarly, Goolsbee (2000) finds no permanent effect of the 1993 individual income tax rate changes on executive compensation. Other researchers—including Hall and Liebman (2000); Armstrong et al. (2019); and Blouin et al. (2020)—also conclude that executive compensation is insulated from individual tax rate changes. Absent renegotiation, one option for executives is to adjust their compensation in response to a change in tax rates using hidden pay. "Hidden pay" refers to the aspects of compensation that are opaque or unknown to shareholders, such as perks, pet projects, and insider trading profits. In many firms, hidden pay comprises a substantial fraction of executives' total compensation.[4]

Our study focuses on the tax responsiveness of a specific form of hidden pay, namely abnormal profits from insider trading. Research suggests that firms use insider trading as a substitute for other forms of compensation. Roulstone (2003) and Henderson (2011) document a positive relation between insider trading restrictions and executive compensation. Similarly, Denis and Xu (2013) find a significant increase in executive compensation following the initial enforcement of insider trading laws. Along these lines, we conjecture that insiders could alter the use of private information in their trades in response to income tax rate changes. Firms may not strictly oppose this behavior. In particular, part of the compensation executives receive is for the risk of holding a concentrated stock portfolio. Since an increase in taxes lowers this compensation, firms may allow executives to reduce their ownership when a tax increase lowers their after-tax compensation.

To illustrate the main idea, consider the case of a risk-averse CEO with shares he or she wishes to sell. The CEO privately observes the true stock price, which differs from the current market price, and has an opportunity to trade on this information. To keep the focus on income tax rates, assume that the shares have a high tax basis, and the capital gains taxes are negligible. The CEO's marginal utility from an additional dollar earned through insider trading relates negatively to his or her after-tax compensation. When the CEO's after-tax compensation is higher, the marginal utility from an additional dollar earned through insider trading is smaller. As income tax rates increase, the CEO's after-tax compensation decreases, and the

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[1] Our findings should not be interpreted as evidence that insider trading is the only or even the most prominent way for executives to adjust their compensation when faced with a change in income tax rates. Executives have other means to adjust net compensation, such as improving personal tax planning or increasing empire-building. The presence of such alternatives may weaken the effects of insider trading.

[2] See Scholes, Wolfson, Erickson, Hanlon, Maydew, and Shevlin (2014, pp. 201−227) and Armstrong et al. (2019) for details.

[3] Another form of equity-based compensation is incentive stock options (ISOs). ISOs are typically not a large component of the total executive compensation because the maximum value of shares exercised under ISOs cannot exceed $100,000. ISO grants and exercises are nontaxable to the recipient. Instead, the recipient recognizes capital gains taxes when shares are sold.

[4] See Edmans, Gabaix, and Jenter (2017) for a detailed discussion.

marginal utility of profits from insider trading increases. Consequently, the CEO becomes more willing to trade on private information.

Our discussion can apply to insider purchases as well. Reputational and legal risks tend to be lower and abnormal insider trading profitability tends to be higher for insider purchases than for insider sales (e.g., Cheng and Lo, 2006; Piotroski and Roulstone, 2007; Dai et al., 2015). How the differences in legal risks affect the sensitivity of trading profits to tax rates is less clear. On the one hand, purchases have lower legal risks and thus may be less sensitive to tax rates. For example, irrespective of tax rates, insiders may use their private information when purchasing shares if they do not face any legal risk. On the other hand, the lower legal risk incentivizes insiders to gather more private information before making purchases (e.g., Seyhun, 1986; Piotroski and Roulstone, 2005; Veenman, 2012). Such incentives could make abnormal profits from purchases more sensitive to tax rates.

Our discussion abstracts away from behavioral biases, such as an aversion to reducing profits when tax rates decline. These biases would not necessarily invalidate our prediction but may lead to asymmetric reactions to tax rate increases and decreases.[5] Additionally, we assume that no other response mechanism, by itself or in combination with others, strictly dominates insider trading. In particular, insiders may respond to tax rate changes in other ways, such as adjusting effort or employing uncertain tax breaks. These alternatives might reduce an insider's willingness to use insider trading but would not eliminate it as long as such alternatives do not strictly dominate insider trading.[6]

3. Research design

We estimate the abnormal insider trading profitability as the intercept from the Fama and French (1993) and Carhart (1997) four-factor model over the 180 days following each day with an insider transaction:

$$\left(R_{i,t} - R_{f,t}\right) = \alpha + \delta_1\left(R_{mkt,t} - R_{f,t}\right) + \delta_2 SMB_t + \delta_3 HML_t + \delta_4 UMD_t + \varepsilon_{i,t}, \tag{1}$$

where R_i is the daily return on firm i's stock obtained from CRSP; R_{mkt} is the value-weighted market return; R_f is the daily risk-free interest rate; SMB and HML are the size and book-to-market factors, respectively (Fama and French, 1993); and UMD is the Carhart's (1997) momentum factor. In this model, α captures the average daily risk-adjusted return to purchases, and $-\alpha$ captures the return to sales (i.e., losses averted by not holding the shares). Accordingly, we define insider trading profitability (Abn_TrdProfits) as α for days when insiders are net purchasers and as $-\alpha$ for days when insiders are net sellers. Higher values of Abn_TrdProfits always indicate higher profitability.[7]

We examine the relation between Abn_TrdProfits and individual income tax rates at the state level. Since federal tax acts can include other important changes and may coincide with other significant events, we focus our main analyses on state-level tax rates and defer the discussion and analysis of federal tax rate changes to Section 5.3. The variation in individual income tax rates across states and the staggered nature of changes to these rates alleviate the concern that a confounding event or changes in macroeconomic factors could drive our findings.

Following Hanushek (1974) and Lewis and Linzer (2005), we use an estimated dependent variable regression model for our analysis. In particular, we estimate the following generalized least squares model that takes into account the variation in sampling variance in (1) [8]

$$\begin{aligned} Abn\_TrdProfits_{i,t} = \alpha &+ \beta_1 StateITR_{i,t} + \beta_2 ResWin_{i,t} + \beta_3 GC_{i,t} + \beta_4 FirmSize_{f,t} + \beta_5 Leverage_{f,t} + \beta_6 SalesGrowth_{f,t} \\ &+ \beta_7 BTM_{f,t} + \beta_8 \Delta GSP_{s,t} + \beta_9 Rep\_Gov_{s,t} + \beta_{10} Rep\_Lgst_{s,t} + \beta_{11} CorpTR_{s,t} + \delta StateFE + \varphi YearFE \\ &+ \psi IndustryFE + \varepsilon_{i,t} \end{aligned} \tag{2}$$

where $StateITR_{i,t}$ is the highest marginal individual income tax rate in year t in the state where insider i's firm is headquartered. Based on our discussions in Section 2.2., we predict β_1 to be positive and significant if managers use insider trading profits to adjust their net compensation implicitly. Given our focus on executives who primarily work at

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[5] The optimal amount of private information used in insider trading depends on the trade-off between expected benefits and penalties. Therefore, in theory, it should be sensitive to both increases and decreases in tax rates. To give an analogy, a person running late for a meeting may be more willing to drive above the speed limit and accept the risk of getting ticketed or having an accident in order to make the meeting. In contrast, if the same person knows that they will be early to the meeting, they may drive slowly. While behavioral biases may cause insiders to react more to tax rate increases than decreases, our findings do not support such an asymmetric reaction.

[6] An empirical assessment of the validity of this assumption is challenging because these mechanisms can be complex and are often not observable or quantifiable. For example, whether and how a manager adjusts his or her effort in response to a change in net compensation depends on the weight of performance-based components in the compensation contract, the sensitivity of a firm's performance to the executive's effort, and the executive's cost of effort among other things. An executive who only receives a fixed cash salary may find it optimal to reduce the effort in response to a tax increase. In contrast, an executive whose compensation is completely tied to the firm's performance may find it optimal not to change their performance, or even increase it following tax rate increases. While we are unaware of any empirical study focusing on executives' efforts in response to changes in tax rates, research suggests that work hours have little association with tax rates for rank-and-file employees (e.g., Mroz, 1987; Heckman, 1993).

[7] Our approach for measuring insider trading profitability follows that of Jagolinzer et al. (2011). Following their research design, if more than one insider from a firm trades on a given date, we aggregate those trades into a single observation.

[8] Our inferences remain the same when we use OLS models with robust standard errors.

the firm's headquarters, we assume that insiders are primarily subject to the tax laws of the state where their firm is headquartered.

We identify state tax rates using data from the Tax Foundation. Most states had several changes to their tax rates over our sample period. Appendix A summarizes these changes. 17 states experienced a 1% or greater change in their tax rates over our sample period, while 15 had the same rate in 2000 and 2019.

Equation (2) includes several control variables. First, following Jagolinzer et al. (2011) and Cao et al. (2014), we control for whether the transaction occurs during a firm-imposed restricted trade window. Specifically, we include an indicator variable (*ResWin*) equal to one if the transaction occurs during the 48 days starting 46 days before an earnings announcement and zero otherwise.[9] Second, we control for the presence of a general counsel. Jagolinzer et al. (2011) report that the average insider trading profits are lower for firms that require general counsel approval for insider trading. We proxy for the presence of a general counsel using an indicator variable (*GC*) equal to one if a general counsel is on the board of directors and zero otherwise. We obtain data for this variable from the BoardEx database. Third, we include the natural logarithm of total assets (*FirmSize*), total debt scaled by assets (*Leverage*), sales growth (*SalesGrowth*), and book-to-market ratio (*BTM*) of the firm for which the insider works to control for firm characteristics. We gather data on these characteristics from Compustat. Finally, following Armstrong et al. (2019), we include the following variables that are measured for the state in which each firm is headquartered to control for time-varying economic and political differences across states: growth in gross state product (*ΔGSP*), an indicator equal to one if the state's governor is from the Republican Party and zero otherwise (*Rep_Gov*), an indicator equal to one if the Republicans have the majority in the state's legislature (*Rep_Lgst*) and zero otherwise, and the highest combined (federal + state) marginal corporate tax rate (*CorpTR*). We obtain data on GSP from the Bureau of Economic Analysis, data on state governors and legislatures from Ballotpedia, and corporate tax rates from the Tax Foundation. Appendix B provides definitions of all variables.

4. Sample selection and summary statistics

We obtain insider trading data from the Thomson Reuters Insider Filings database. We limit our sample to top corporate executives who are more likely to possess inside information, are compensated by the firm, and work at the firm's headquarters. Specifically, following Davidson et al. (2020), we focus our analyses on the insiders with the following titles: CEO, CFO, CIO, COO, CTO, president, executive or senior vice president, or general counsel.[10] To ensure that our definition of executives does not drive our results, we also conduct our tests using only CEOs.

Our sample selection begins with executives' open-market trades (trancode = "S" or "P") for which stock return data is available for estimating α. We exclude observations that lack data on trade size. To alleviate the impact of any influential observation, we eliminate the observation with the largest absolute studentized residual in the estimation of α, following Belsley et al. (1980).[11] Our final sample consists of 147,976 daily observations. On 133,928 days, executives are sellers of their firm's stock, and on 14,305, they are buyers.[12] CEO trades account for about half of the observations in our sample.[13] Of the 74,103 daily observations in the CEO sample, 65,862 are days when CEOs are sellers, and 8295 are days when CEOs are buyers.

Table 1 reports the summary statistics. Panel A reports the statistics for the sample of all executives. The mean and median *Abn_TrdProfits* for all transactions are 0.022 and 0.018, respectively, suggesting that insider trades are profitable on average. The mean and median values are notably higher for purchases (0.069 and 0.050, respectively) than for sales (0.017 and 0.015, respectively). Most sales (68.3%) occur during the estimated restricted trading window, whereas a smaller portion of purchases occurs during this window (38.9%). The percentage of observations where the firm has a general counsel on the board of directors is 45.1% and 42.0% for the sales and purchase subsamples, respectively. The mean state individual income tax rate is 6.4% in the full sample, 6.6% in the sales subsample, and 5.4% in the purchases subsample. The means of firm size, leverage, sales growth, and book-to-market in the full sample are 7.6, 0.201, 0.161, and 0.413, respectively. Firms in the purchases subsample are smaller, more levered, and have lower sales growth and higher book-to-market ratios than those in the sales subsample. In terms of the state characteristics, the mean gross state product growth rate is 2.2% in the full sample, and the mean highest combined corporate tax rate is 40.9%. The state governor is a Republican in 51.5% of the observations, but the Republicans are a majority in the state legislature only in 32.4% of the observations.

Panel B of Table 1 reports the summary statistics for the CEO sample. The mean and median values of variables generally resemble those in Panel A. Average trading profits are larger in the purchases subsample than in the sales subsample, and firm and state characteristics are comparable to those in Panel A.

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[9] Jagolinzer et al. (2011) hand collect data on the restricted windows for their sample of 260 firms. The authors note that the average size of these restricted windows is 48, starting 46 days before and ending a day after the earnings announcement date. We follow Cao et al. (2014) and approximate the restricted window as these 48 days for the large sample analysis.

[10] Our inferences remain identical when we limit our sample to just officers (CEO, CFO, CIO, COO, and CTO), following Skaife et al. (2013).

[11] As detailed by Core (2006), excluding outliers that are not data errors is inappropriate. Therefore, we only exclude one extreme observation. Our inferences remain the same when we include all observations or exclude observations with studentized residuals above three.

[12] We measure daily net transactions as the difference between purchases and sales. Since there are some days where insiders both purchase and sell shares, the subsamples have more observations in total than the daily net transactions sample.

[13] This is comparable to the results of Brenner (2015, Table 3), who finds that CEOs comprise approximately 40% of insider trading transactions among the executives.

Table 1
Summary statistics. This table presents summary statistics for the variables used in our analyses. Panels A and B present summary statistics for the all-executives and CEOs samples, respectively. Panel C reports the distribution of observations by industry. Detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile.

Panel A: All Executives

	All Transactions (N = 147,976)					Sales (N = 133,928)					Purchases (N = 14,305)				
	Mean	SD	25%	50%	75%	Mean	SD	25%	50%	75%	Mean	SD	25%	50%	75%
Abn_TrdProfits	0.022	0.190	−0.081	0.018	0.119	0.017	0.181	−0.082	0.015	0.114	0.069	0.268	−0.071	0.050	0.181
StateITR	6.4	4.1	4.6	6.0	9.3	6.6	4.1	4.6	6.0	9.3	5.4	3.9	3.0	5.5	7.7
ResWin	0.667	0.471	0.000	1.000	1.000	0.683	0.465	0.000	1.000	1.000	0.389	0.487	0.000	0.000	1.000
GC	0.448	0.497	0.000	0.000	1.000	0.451	0.498	0.000	0.000	1.000	0.420	0.494	0.000	0.000	1.000
FirmSize	7.6	1.7	6.3	7.5	8.7	7.7	1.7	6.4	7.5	8.8	7.3	1.7	6.2	7.3	8.4
Leverage	0.201	0.195	0.014	0.158	0.321	0.193	0.190	0.011	0.149	0.311	0.275	0.223	0.082	0.248	0.417
SalesGrowth	0.161	0.257	0.029	0.113	0.241	0.171	0.249	0.039	0.121	0.248	0.072	0.319	−0.069	0.029	0.140
BTM	0.413	0.327	0.197	0.335	0.541	0.378	0.271	0.191	0.316	0.501	0.758	0.755	0.387	0.636	0.975
ΔGSP	0.022	0.022	0.010	0.022	0.037	0.023	0.021	0.011	0.023	0.037	0.017	0.024	0.004	0.018	0.032
Rep_Gov	0.515	0.500	0.000	1.000	1.000	0.510	0.500	0.000	1.000	1.000	0.565	0.496	0.000	1.000	1.000
Rep_Lgst	0.324	0.468	0.000	0.000	1.000	0.317	0.465	0.000	0.000	1.000	0.396	0.489	0.000	0.000	1.000
CorpTR	40.9	4.3	40.5	42.5	43.8	40.9	4.3	40.5	42.5	43.8	40.2	4.8	39.6	41.9	43.8
Volume	0.016	0.031	0.002	0.005	0.016	0.017	0.032	0.002	0.005	0.016	0.005	0.015	0.000	0.001	0.003

Panel B: CEOs

	All Transactions (N = 74,103)					Sales (N = 65,862)					Purchases (N = 8295)				
	Mean	SD	25%	50%	75%	Mean	SD	25%	50%	75%	Mean	SD	25%	50%	75%
Abn_TrdProfits	0.024	0.194	−0.082	0.020	0.123	0.019	0.185	−0.083	0.017	0.117	0.067	0.269	−0.075	0.046	0.182
StateITR	6.6	4.1	4.6	6.0	9.3	6.7	4.1	4.8	6.0	9.3	5.3	3.8	3.0	5.3	7.5
ResWin	0.610	0.488	0.000	1.000	1.000	0.635	0.481	0.000	1.000	1.000	0.383	0.486	0.000	0.000	1.000
GC	0.427	0.495	0.000	0.000	1.000	0.431	0.495	0.000	0.000	1.000	0.392	0.488	0.000	0.000	1.000
FirmSize	7.5	1.7	6.2	7.3	8.5	7.5	1.7	6.2	7.3	8.5	7.2	1.7	6.0	7.1	8.3
Leverage	0.191	0.193	0.008	0.143	0.307	0.180	0.185	0.005	0.132	0.294	0.277	0.232	0.076	0.246	0.420
SalesGrowth	0.167	0.265	0.032	0.120	0.251	0.181	0.256	0.044	0.131	0.262	0.065	0.338	−0.078	0.019	0.130
BTM	0.414	0.344	0.192	0.326	0.544	0.369	0.274	0.183	0.304	0.492	0.783	0.844	0.400	0.664	1.034
ΔGSP	0.022	0.021	0.010	0.022	0.037	0.023	0.021	0.012	0.023	0.037	0.016	0.024	0.004	0.018	0.031
Rep_Gov	0.521	0.500	0.000	1.000	1.000	0.517	0.500	0.000	1.000	1.000	0.551	0.497	0.000	1.000	1.000
Rep_Lgst	0.318	0.466	0.000	0.000	1.000	0.308	0.462	0.000	0.000	1.000	0.396	0.489	0.000	0.000	1.000
CorpTR	40.9	4.3	40.5	42.5	43.8	41.0	4.3	40.5	42.8	43.8	40.2	4.9	39.6	42.0	43.5
Volume	0.021	0.040	0.002	0.008	0.021	0.179	0.156	0.003	0.009	0.024	0.015	0.131	0.000	0.001	0.005

Panel C: Distribution over industries

Description	All Executives			CEOs		
	All	Sales	Purch.	All	Sales	Purch.
Food	2816	2600	222	1515	1392	123
Mining and Minerals	1013	795	219	470	332	138
Oil	4208	3631	594	1972	1594	381
Textiles	2634	2491	144	1510	1439	71
Consumer Durables	1548	1244	306	744	547	198
Chemicals	2354	2073	286	1148	1033	118
Drugs, Soap, Perfumes, & Tobacco	5761	5328	437	3083	2859	225
Construction	3792	3424	374	1828	1641	187
Steel Works	1102	947	157	552	475	77
Fabricated Products	861	761	100	384	338	46
Machinery & Equipment	22,890	21,359	1560	11,887	10,990	908
Automobiles	1639	1428	215	748	631	119
Transportation	5757	5402	365	2737	2505	237
Utilities	3483	2891	607	1488	1177	312
Retail Stores	10,413	9493	928	5421	4821	603
Financials	21,884	18,191	3766	10,050	7855	2208
Other	55,821	51,870	4025	28,566	26,223	2344
Obs. count	147,976	133,928	14,305	74,103	65,852	8295

In Panel C of Table 1, we break down our samples by Fama-French 17 industry codes. The most represented industry across all samples is "other," which broadly captures various industries. Among the identified industries, those with the largest representation are machinery and equipment, financials, and retail stores. The industry composition remains consistent across the subsamples.

5. Empirical analyses

5.1. State tax rates and abnormal insider trading profitability

We begin by examining whether abnormal insider trading profitability is associated with state income tax rates. Table 2 presents the results from estimating the model in Equation (2). We report two specifications: one with no control variables and one with all control variables, including the fixed effects.[14] We cluster the standard errors by firm and transaction date.

Table 2 shows a positive and statistically significant relation between state income tax rates and abnormal insider trading profitability. The coefficient on *StateITR* in the full model for all executives in column (2) is 0.0085. In terms of economic magnitude and considering that the median annual insider trade size in our sample is $788,985, this coefficient suggests that a one percentage point increase in income tax rates would translate to a $6706 increase in trading profits for the median insider. To put this into context, a one percentage point increase in income tax rates will increase the same insider's tax liability by $34,272 (=1% x $3,427,240, the median insider's estimated annual compensation subject to income taxes).[15] Thus, we estimate that insiders use their trades to offset approximately 19.6% (=$6706/$34,272) of the effect of taxes. Columns (3) through (6) show that these inferences hold for both sales and purchases. The abnormal profitability from both types of transactions is significantly associated with state tax rates of similar magnitudes.

In the analyses of CEO trades, reported in columns (7) through (12), we again find that *Abn_TrdProfits* is strongly positively associated with state income tax rates. The coefficient on *StateITR* in column (8) is 0.0101. For sales, the coefficient is 0.0101 in column (10); for purchases, it is 0.0128 in column (12). Considering that the median annual CEO trade size in our sample is $825,317, based on column (8), we estimate that a one percentage point increase in state tax rates is associated with an $8336 increase in the median CEO's insider trading profits. This increase is equivalent to 12.2% of the estimated decrease in the same CEO's compensation subject to income taxes ($68,415) due to a one percentage point change in the tax rates. Overall, our findings in Table 2 indicate that executives become more willing to use private information in their trades when an increase in taxes decreases their net compensation.

5.2. Cross-sectional tests

In this section, we consider four factors that might affect the sensitivity of insider trading profitability to income tax rates: insiders' compensation, their shareholdings, the effectiveness of oversight over managerial actions, and the availability of private information. In these analyses, we employ measures from additional datasets and remove firms with insufficient data to calculate the measure needed for a given test. As a result, there is some sample attrition within each test. For brevity's sake, we present our findings for all transactions using all control variables. Our inferences remain identical when we do not include the control variables or focus on sales only. We find weak results for purchases in several cross-sectional tests. We surmise that this is partly because of the weaker statistical power in these tests and partly because current shareholdings and the effectiveness of oversight are less important considerations in purchases.

5.2.1. The role of insiders' compensation

To the extent that insiders are risk-averse, the marginal utility from abnormal insider trading profits should decline with insiders' total compensation/wealth (Kallunki et al., 2018). Since taxes reduce net compensation, they increase the marginal utility from abnormal insider trading profits. Assuming risk-aversion, the increase in marginal utility is larger for insiders with relatively low compensation. Thus, we predict abnormal trading profitability to be more sensitive to income tax rates among executives with relatively low compensation.

To test this prediction, we examine the variation in our results based on the level of compensation. We gather data on executive compensation from ExecuComp and restrict our sample to firms with nonmissing data for the top five executives.[16] We rank firms based on the mean total compensation of the top executives in the year preceding the observation year. We classify executives who work at firms at the bottom tercile as those with relatively low compensation (*LowComp* = 1). We expect a stronger association between these executives' abnormal insider trading profitability and tax rates. We report results from this analysis in the first two columns of Table 3.

The estimates reported in the first two columns of Table 3 show that abnormal profitability from insider trading is more strongly associated with tax rates when insiders have relatively low compensation. In the analysis of all executives, the coefficient on the *StateITR x LowComp* is 0.0021. This suggests that for each percentage point increase in state taxes, a relatively low compensated insider will see their abnormal profitability increase by 21 basis points more than other insiders. For CEOs,

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[14] State fixed effects allow us to focus on deviations from the state's average tax rate and control for time-invariant state-specific factors. Since firms rarely change the location of their headquarters, adding firm fixed effects subsumes both the state and industry fixed effects. In untabulated analyses, we find that our inferences continue to hold when we replace state and industry fixed effects with firm fixed effects, except that our findings in the purchases subsample become statistically weaker.

[15] We measure the median executive's estimated annual compensation subject to income taxes as the sample median of the TDC1 variable from ExecuComp (equals to the sum of salary, bonus, the total value of restricted stocks granted, the total value of stock options granted (using Black-Scholes), long-term incentive payouts, and any other compensation).

[16] Our inferences remain unchanged when we require data availability for three or four executives instead.

Table 2
State tax rates and abnormal insider trading profitability. This table presents coefficient estimates from GLS regressions of *Abn_TrdProfits* on *StateITR* and control variables using the Lewis and Linzer (2005) adjustment for estimated dependent variables. Columns (1)–(6) present results for trades of all executives, and columns (7)–(12) present them for only CEOs. A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. T-statistics are reported in parentheses and are based on standard errors clustered by firm and transaction date.***,**, and* indicate statistical significance at a two-sided 1%, 5%, and 10% level, respectively.

	All Executives						CEOs					
	All Transactions		Sales		Purchases		All Transactions		Sales		Purchases	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
StateITR	0.0034***	0.0085***	0.0035***	0.0084***	0.0041***	0.0077**	0.0034***	0.0101***	0.0035***	0.0101***	0.0051***	0.0128***
	(6.74)	(6.65)	(6.65)	(6.28)	(2.80)	(2.07)	(4.60)	(5.78)	(4.45)	(5.47)	(2.58)	(2.76)
ResWin		0.0020		0.0116***		−0.0160		−0.0027		0.0076*		−0.0253**
		(0.73)		(4.07)		(-1.64)		(-0.69)		(1.85)		(-2.08)
GC		−0.0035		−0.0037		0.0044		−0.0076		−0.0088		0.0084
		(-0.94)		(-0.93)		(0.40)		(-1.49)		(-1.64)		(0.61)
FirmSize		−0.0041***		−0.0004		−0.0190***		−0.0051***		−0.0008		−0.0197***
		(-3.45)		(-0.28)		(-5.80)		(-2.88)		(-0.42)		(-4.70)
Leverage		−0.0368***		−0.0538***		0.0021		−0.0337**		−0.0564***		−0.0262
		(-3.59)		(-5.01)		(0.08)		(-2.12)		(-3.18)		(-0.87)
SalesGrowth		0.0434***		0.0473***		0.0058***		0.0391***		0.0379***		0.0496***
		(4.79)		(4.80)		(2.63)		(3.44)		(2.92)		(2.79)
BTM		−0.0767***		−0.1179***		0.0023		−0.0719***		−0.1181***		−0.0222**
		(-11.80)		(-14.95)		(0.47)		(-7.69)		(-9.77)		(-2.20)
ΔGSP		0.1438		0.1084		0.4769		0.0801		0.0343		0.1977
		(1.20)		(0.86)		(1.49)		(0.47)		(0.19)		(0.40)
Rep_Gov		−0.0102**		−0.0097**		−0.0079		−0.0079		−0.0079		−0.0038
		(-2.47)		(-2.25)		(-0.64)		(-1.32)		(-1.26)		(-0.24)
Rep_Lgst		−0.0090		−0.0008		−0.0467***		−0.0168		−0.0064		−0.0648***
		(-1.12)		(-0.09)		(-2.60)		(-1.41)		(-0.48)		(-2.95)
CorpTR		−0.0000		−0.0005		−0.0001		−0.0038		−0.0053*		0.0064
		(-0.00)		(-0.21)		(-0.01)		(-1.38)		(-1.81)		(0.67)
Obs. count	147,976	147,976	133,928	133,928	14,305	14,305	74,103	74,103	65,862	65,862	8295	8295
Adjusted R^2	0.005	0.052	0.006	0.066	0.003	0.071	0.005	0.054	0.006	0.069	0.005	0.114
State FE	−	✓	−	✓	−	✓	−	✓	−	✓	−	✓
Year FE	−	✓	−	✓	−	✓	−	✓	−	✓	−	✓
Industry FE	−	✓	−	✓	−	✓	−	✓	−	✓	−	✓

Table 3

The role of insiders' compensation and shareholdings. This table presents coefficient estimates from GLS regressions of *Abn_TrdProfits* on *StateITR*, its interaction with the proxies for low insiders compensation (*LowComp),* low insiders' shareholdings (*LowSH*), low insider shareholdings with a high tax basis *(LowSH w/HB),* and control variables using the Lewis and Linzer (2005) adjustment for estimated dependent variables. A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. Models are estimated using all insider transactions. t-statistics are reported in parentheses and are based on standard errors clustered by firm and transaction date.***,**, and* indicate statistical significance at a two-sided 1%, 5%, and 10% level, respectively.

	LowComp		LowSH		LowSH w/HB	
	All Execs	CEOs	All Execs	CEOs	All Execs	CEOs
StateITR	**0.0070*** **	**0.0075*** **	**0.0076*** **	**0.0093*** **	**0.0061*** **	**0.0074*** **
	(5.36)	**(3.73)**	**(5.82)**	**(5.15)**	**(4.29)**	**(3.84)**
Factor	−0.0015	−0.0138	−0.0183***	−0.0215**	−0.0463***	−0.0602***
	(-0.22)	(-1.35)	(-2.63)	(-2.16)	(-4.03)	(-3.61)
Factor x StateITR	**0.0021** **	**0.0029** **	**0.0020***	**0.0023***	**0.0033*** **	**0.0041** **
	(2.40)	**(2.13)**	**(1.94)**	**(1.68)**	**(2.73)**	**(2.43)**
ResWin	0.0033	−0.0010	0.0039	−0.0010	0.0039	−0.0009
	(1.16)	(-0.24)	(1.36)	(-0.25)	(1.36)	(-0.23)
GC	−0.0030	−0.0062	−0.0024	−0.0056	−0.0022	−0.0051
	(-0.77)	(-1.14)	(-0.63)	(-1.01)	(-0.57)	(-0.95)
FirmSize	−0.0054***	−0.0052**	−0.0032***	−0.0043**	−0.0034***	−0.0045**
	(-3.54)	(-2.56)	(-2.71)	(-2.42)	(-2.89)	(-2.53)
Leverage	−0.0310***	−0.0283*	−0.0338***	−0.0299*	−0.0317***	−0.0271*
	(-3.01)	(-1.80)	(-3.27)	(-1.89)	(-3.15)	(-1.78)
SalesGrowth	0.0399***	0.0422***	0.0427***	0.0433***	0.0413***	0.0407***
	(4.13)	(3.43)	(4.47)	(3.55)	(4.34)	(3.36)
BTM	−0.0711***	−0.0685***	−0.0750***	−0.0693***	−0.0738***	−0.0678***
	(-9.75)	(-6.36)	(-10.68)	(-6.79)	(-10.64)	(-6.73)
ΔGSP	0.2161*	0.1978	0.2245*	0.1954	0.2273*	0.2121
	(1.79)	(1.13)	(1.87)	(1.12)	(1.90)	(1.23)
Rep_Gov	−0.0069	−0.0023	−0.0074*	−0.0026	−0.0075*	−0.0031
	(-1.62)	(-0.37)	(-1.74)	(-0.42)	(-1.77)	(-0.49)
Rep_Lgst	−0.0084	−0.0202	−0.0078	−0.0196	−0.0064	−0.0166
	(-1.03)	(-1.63)	(-0.96)	(-1.57)	(-0.80)	(-1.39)
CorpTR	−0.0001	−0.0030	0.0000	−0.0026	−0.0000	−0.0029
	(-0.05)	(-1.07)	(0.00)	(-0.95)	(-0.02)	(-1.05)
Obs. Count	133,279	65,388	133,279	65,388	133,279	65,388
Adjusted R^2	0.052	0.056	0.051	0.055	0.052	0.057
State FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓	✓	✓

we find that the effect size is 29 basis points. These results indicate that an insider's level of compensation affects how much they adjust their compensation through trading profitability in response to changes in tax rates.

5.2.2. The role of insiders' shareholdings

Insiders can increase their trading profits by conducting larger trades or by using more private information to increase their profit per share. The substitutability between trade size and per share profitability suggests that the abnormal trading profitability becomes more sensitive to income tax rates when insiders have stronger incentives to adjust their profits through per share profitability rather than through trade size. We conjecture that such strong incentives exist when an insider's shareholdings are relatively small, especially if the shares the insider owns also have a high tax basis (i.e., when the capital gains tax burden on the insider profits is small).

To test this prediction, we gather data on executive shareholdings from ExecuComp. As we did in the compensation test, we restrict our sample to firms with nonmissing data for the top five executives.[17] We rank firms based on their executives' average shareholdings, which is defined as the dollar value of shareholdings as a percentage of total compensation. We classify executives who work at firms in the bottom tercile as those with relatively low shareholdings (*LowSH*). Within this bottom tercile, we rank firms based on their executives' average capital gains tax burden as a percentage of the executive's stock holdings, which we estimate following Yost (2018). We classify executives who work at firms in the bottom tercile of capital gains tax burden as those with relatively low shareholdings with a high tax basis (*LowSH w/HB*). We predict abnormal insider trading profits to be more sensitive to income tax rates when insiders have low shareholdings, particularly if the shares also have a high tax basis. We report results from these analyses in the last four columns of Table 3.

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[17] Our inferences remain unchanged when we require data availability for three or four executives instead. Additionally, while we use the SHROWN_EXCL_OPTS variable in reported tests, our inferences are robust to the use of the SHROWN_TOT variable. This variable includes options but is primarily available after the adoption of SFAS 123R in 2006.

In columns (3) and (4) of Table 3, we find a positive and significant coefficient on *StateITR x LowSH*. Our findings suggest that for each percentage point increase in tax rates, executives (CEOs) with low shareholdings increase their abnormal trading profitability by 20 (23) basis points more than the other executives (CEOs). Columns (5) and (6) show that the results are stronger among insiders with both low shareholdings and a high tax basis. We find that for each percentage point increase in tax rates, executives (CEOs) with low shareholdings and a high tax basis increase their abnormal trading profitability by 33 (41) basis points more than other executives (CEOs). Overall, these results are consistent with our assertion that insiders' shareholdings play a role in how sensitive the use of private information is to tax rates.

5.2.3. The role of monitoring

Research suggests that insiders tend to profit less from their private information when their trades are monitored more closely. This is because they wish to avoid the higher risk of facing penalties. Better internal controls (e.g., Bettis et al., 2000; Jagolinzer et al., 2011; Skaife et al., 2013), stronger shareholder rights and monitoring (e.g., Demsetz, 1986; Cziraki et al., 2014; Fu et al., 2020), and better enforcement (e.g., Garfinkel, 1997; Cline and Posylnaya, 2019) are all associated with lower abnormal insider trading profits. We conjecture that effective monitoring also increases the sensitivity of abnormal insider trading profitability to income tax rates by accentuating the risk-reward trade-off for using private information in insider trades. When monitoring is ineffective, insiders can exploit their private information under any tax regime, and abnormal trading profitability is insensitive to income tax rates. In contrast, when monitoring is somewhat effective, insiders face a trade-off between using private information to earn abnormal profits and the risk of detection. In equilibrium, some of their private information will remain "unused." Since tax rates affect this equilibrium, the optimal amount of private information that an insider decides to use should exhibit greater sensitivity to tax rates.[18]

We use two proxies to measure the effectiveness of a firm's monitoring: the strength of internal controls and the firm's tendency to obey regulations and laws. As our measure of the strength of internal controls, we use the Audit Analytics database to generate an indicator variable *NoICW*. This variable is equal to one for firms with no internal control weaknesses over the three years ending in the observation year and zero otherwise. Since internal control weaknesses were not reported before 2004, we limit our sample for this analysis to the post-2004 period. Our second proxy, a firm's tendency to obey regulations, captures each firm's monitoring of managerial actions and the ethical aspects of its corporate culture. For this proxy, we use data from Good Jobs First, a national policy resource center promoting corporate and government accountability. Good Jobs First maintains a comprehensive database, called Violation Tracker, of enforcement actions by 47 federal agencies since 2000. For each firm in our sample, we first aggregate the total dollar value of the penalties the firm incurred over the three years ending in the observation year and scale it by the firm's total assets at the end of the observation year. For each year, we then classify firms in the bottom tercile of this measure as those that are more ethical, i.e., those that have stronger monitoring of managerial actions (*LowMisconduct*). We predict abnormal trading profitability to be lower but more sensitive to tax rates in firms with better monitoring.

Table 4 presents our results. In the first column, the interaction of *NoICW* and *StateITR* is positive and significant, suggesting that insider trading profitability is more sensitive to tax rates when monitoring is stronger. The second column presents similar evidence using the CEO sample, with the interaction term being positive and significant. The coefficient on *NoICW* in both columns has a negative sign but is statistically insignificant.

The last two columns report results based on *LowMisconduct*. In both columns, we find that the main effect on *LowMisconduct* is negative and significant, consistent with prior findings that better compliance and ethics reduce abnormal trading profitability (e.g., Jagolinzer et al., 2011; Skaife et al., 2013). In both columns, the interaction term is positive and significant at the 10% level. Overall, the evidence from Table 4 is consistent with our expectation that executives at firms with stronger monitoring have lower trading profits that are more sensitive to tax rates.

5.2.4. The role of private information

The extent to which executives can adjust their insider trading profits depends on their amount of private information.[19] When there is greater information asymmetry between insiders and outside investors, the insiders can adjust their trading profitability more easily. Therefore, we expect the sensitivity of abnormal insider trading profits to income tax rates to be higher when the information asymmetry between insiders and investors is larger.

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[18] Our prediction builds on the assumption that the probability of detection or the penalty for trading on private information is not large. Otherwise, using private information in trades would become prohibitively costly for executives. Studies support this assumption. For example, Augustin et al. (2019) find that of the 1859 takeover announcements in their sample, 467 exhibit patterns consistent with illegal insider trading before a takeover announcement, but regulators litigated only 43 of these suspect firms (9%) for insider trading. Ahern (2017) explains that the SEC focuses on large and ongoing insider trades in part because its lawyers are evaluated based on the amount of penalties that they collect from their cases, and these penalties are based on the size of the illegal insider trading profits. Thus, occasional or small illegal insider trades are more likely to go undetected. Along these lines, Kacperczyk and Pagnotta (2019) find that insiders manage the size of their trades to reduce the legal risk of insider trading.

[19] Studies document that insider trading profits are higher when there is greater information asymmetry between insiders and outside investors (e.g., Frankel and Li, 2004; Aboody and Lev, 2000; Dai et al., 2015; Aboody et al., 2005). There is also ample evidence that insiders trade profitably ahead of corporate events (Keown and Pinkerton, 1981; Lee et al., 1992; Seyhun and Bradley, 1997; Ke et al., 2003; Huddart et al., 2007; Ryan et al., 2016; Even-Tov and Ozel, 2021), which is consistent with their private information about the outcome of these events.

Table 4

The role of monitoring effectiveness and corporate ethics. This table presents coefficient estimates from GLS regressions of *Abn_TrdProfits* on *StateITR*, its interaction with the proxies for relatively strong monitoring effectiveness (*NoICW and LowMisconduct*), and control variables using the Lewis and Linzer (2005) adjustment for estimated dependent variables. A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. Models are estimated using all insider transactions. t-statistics are reported in parentheses and are based on standard errors clustered by firm and transaction date.***,**, and* indicate statistical significance at a two-sided 1%, 5%, and 10% level, respectively.

	NoICW		LowMisconduct	
	All Execs	CEOs	All Execs	CEOs
StateITR	**0.0061***	**0.0072***	**0.0071***	**0.0088***
	(4.66)	**(3.81)**	**(4.35)**	**(3.75)**
Factor	−0.0302	−0.0225	−0.0202***	−0.0275***
	(−1.46)	(−0.89)	(−2.99)	(−2.82)
Factor x StateITR	**0.0052***	**0.0040**	**0.0017***	**0.0024***
	(3.19)	**(2.00)**	**(1.76)**	**(1.73)**
ResWin	0.0027	−0.0007	0.0009	−0.0046
	(0.99)	(−0.17)	(0.30)	(−0.98)
GC	−0.0030	−0.0075	0.0010	−0.0024
	(−0.80)	(−1.49)	(0.22)	(−0.40)
FirmSize	−0.0049***	−0.0072***	−0.0035***	−0.0047**
	(−3.82)	(−3.34)	(−2.72)	(−2.49)
Leverage	−0.0357***	−0.0298*	−0.0385***	−0.0249
	(−3.51)	(−1.91)	(−3.30)	(−1.46)
SalesGrowth	0.0414***	0.0365***	0.0442***	0.0426***
	(4.61)	(3.21)	(4.11)	(3.13)
BTM	−0.0735***	−0.0657***	−0.0791***	−0.0756***
	(−10.91)	(−6.62)	(−11.02)	(−7.79)
ΔGSP	0.0640	0.0668	−0.0789	−0.2081
	(0.54)	(0.40)	(−0.60)	(−1.14)
Rep_Gov	−0.0085**	−0.0053	−0.0110**	−0.0111*
	(−2.04)	(−0.88)	(−2.40)	(−1.68)
Rep_Lgst	−0.0120	−0.0215*	−0.0086	−0.0169
	(−1.52)	(−1.88)	(−0.95)	(−1.23)
CorpTR	0.0004	−0.0036	−0.0015	−0.0030
	(0.18)	(−1.29)	(−0.65)	(−0.99)
Obs. Count	123,200	61,401	101,794	49,848
Adjusted R²	0.053	0.056	0.055	0.063
State FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓

We use four proxies for information asymmetry: media coverage (e.g., Dai et al., 2015), analyst following (e.g., Hong et al., 2000; Frankel and Li, 2004), R&D activities (Aboody and Lev, 2000), and bid-ask spread (Copeland and Galai, 1983). We measure media coverage as the total number of stories published in the media about the firm over the observation year adjusted by the median number of articles and press releases for the firms in the same industry using the Ravenpack database.[20] To measure the analyst following, defined as the total number of analysts issuing an earnings forecast for the firm in the observation year, we use the I/B/E/S database. We measure R&D activities as the R&D expenses as a percentage of total assets at the end of the observation year. We measure bid-ask spread as the average spread between the daily closing ask and bid values in CRSP over the observation year. For each year, we rank firms based on each proxy. We then classify firms at the bottom tercile of media coverage (*LowMedia*) or analyst following (*LowAF*) and those at the top tercile of R&D activities (*HighRD*) or bid-ask spread (*HighBA*) as high information asymmetry firms.

We report results from these analyses in Table 5. The interaction term has a positive sign in all columns and is statistically significant at the 5% level when the proxy for information asymmetry is *LowMedia* or *HighRD*. The results are statistically weaker when the proxy is *HighBA* or *LowAF*. For *HighBA*, the coefficient is significant in the all-executives sample at the 10% level, but the significance does not hold in the CEOs sample. When considering *LowAF*, both coefficients on the interaction term have a positive sign but are not statistically significant. Altogether, these findings support our prediction that insider trading profitability is more sensitive to tax rates for firms with greater information asymmetry.

5.3. Event studies

5.3.1. Changes in abnormal insider trading profitability around state tax rate changes

The panel data analysis we use in our main tests allows us to expand our sample size, especially for the relatively infrequent insider purchases. In this section, we use an event study approach and examine changes in abnormal insider

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[20] Because of inherent differences in media coverage among industries and changes in the Ravenpack database over time, we industry adjust the media coverage. Our inferences remain the same when we do not industry adjust.

Table 5
The role of information asymmetry. This table presents coefficient estimates from GLS regressions of *Abn_TrdProfits* on *StateITR*, its interaction with the proxies for higher information asymmetry (*LowMedia, LowAF, HighRD,* and *HighBA*), and control variables using the Lewis and Linzer (2005) adjustment for estimated dependent variables. A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. Models are estimated using all insider transactions. t-statistics are reported in parentheses and are based on standard errors clustered by firm and transaction date.***,**, and* indicate statistical significance at a two-sided 1%, 5% and 10% level, respectively.

	LowMedia		LowAF		HighRD		HighBA	
	All Execs	CEOs	All Execs	CEOs	All Execs	CEOs	All Execs	CEOs
StateITR	**0.0063***	**0.0075***	**0.0083***	**0.0097***	**0.0074***	**0.0086***	**0.0017***	**0.0098***
	(5.22)	**(4.52)**	**(6.36)**	**(5.50)**	**(5.65)**	**(4.96)**	**(2.73)**	**(5.35)**
Factor	−0.0125*	−0.0312***	−0.0133*	−0.0205*	−0.0311***	−0.0271**	−0.0095	−0.0075
	(−1.79)	(−3.25)	(−1.73)	(−1.81)	(−4.40)	(−2.54)	(−1.22)	(−0.64)
FactorxStateITR	**0.0021**	**0.0024**	**0.0018**	**0.0023**	**0.0022**	**0.0029**	**0.0017*	**0.0013**
	(2.36)	**(2.02)**	**(1.55)**	**(1.48)**	**(2.50)**	**(2.38)**	**(1.72)**	**(0.92)**
ResWin	0.0022	−0.0019	−0.0036	−0.0075	0.0021	−0.0028	0.0006	−0.0025
	(0.90)	(−0.56)	(−0.96)	(−1.48)	(0.77)	(−0.72)	(0.21)	(−0.63)
GC	−0.0019	−0.0052	−0.0040***	−0.0051***	−0.0032	−0.0080	−0.0061	−0.0078
	(−0.56)	(−1.14)	(−3.40)	(−2.89)	(−0.85)	(−1.57)	(−1.56)	(−1.53)
FirmSize	−0.0073***	−0.0072***	−0.0370***	−0.0337**	−0.0031***	−0.0047**	−0.0020*	−0.0051***
	(−6.68)	(−4.87)	(−3.61)	(−2.13)	(−2.58)	(−2.53)	(−1.76)	(−2.86)
Leverage	−0.0159*	−0.0094	0.0430***	0.0383***	−0.0405***	−0.0351**	−0.0301***	−0.0335**
	(−1.91)	(−0.78)	(4.75)	(3.38)	(−3.87)	(−2.18)	(−2.96)	(−2.13)
SalesGrowth	0.0485***	0.0441***	−0.0773***	−0.0725***	0.0433***	0.0386***	0.0428***	0.0392***
	(6.29)	(4.64)	(−11.94)	(−7.79)	(4.81)	(3.39)	(4.65)	(3.43)
BTM	−0.0546***	−0.0533***	0.1472	0.0819	−0.0807***	−0.0739***	−0.0673***	−0.0723***
	(−10.78)	(−7.62)	(1.23)	(0.49)	(−12.25)	(−7.91)	(−10.57)	(−7.73)
ΔGSP	0.1503	0.1138	−0.0102**	−0.0078	0.1371	0.0715	0.0952	0.0912
	(1.39)	(0.76)	(−2.46)	(−1.31)	(1.14)	(0.42)	(0.91)	(0.54)
Rep_Gov	−0.0071**	−0.0051	−0.0091	−0.0170	−0.0098**	−0.0076	−0.0105***	−0.0087
	(−2.02)	(−1.02)	(−1.13)	(−1.42)	(−2.34)	(−1.25)	(−2.66)	(−1.44)
Rep_Lgst	−0.0078	−0.0137	−0.0000	−0.0038	−0.0101	−0.0178	0.0060	−0.0158
	(−1.11)	(−1.36)	(−0.01)	(−1.37)	(−1.25)	(−1.49)	(1.32)	(−1.33)
CorpTR	0.0004	−0.0029	0.0022	−0.0027	0.0002	−0.0037	−0.0009	−0.0038
	(0.23)	(−1.20)	(0.78)	(−0.69)	(0.10)	(−1.35)	(−1.16)	(−1.39)
Obs. count	147,976	74,103	147,976	74,103	147,976	74,103	147,976	74,103
Adjusted R^2	0.066	0.071	0.052	0.055	0.053	0.055	0.042	0.054
State, Year, Ind. FEs	✓	✓	✓	✓	✓	✓	✓	✓

trading profits around state tax rate changes to strengthen our identification at the cost of sample size. In particular, we use a difference-in-differences model and compare changes in abnormal insider trading profitability in states that experienced a tax rate change in a given year with those that did not. To ensure that the events we examine had a measurable impact on insiders' net compensation, we focus on income tax rate changes of two percent or more.

Specifically, we estimate the following model:

$$Abn\_TrdProfits_{i,t} = \alpha + \partial_1 Post_{i,t} + \partial_2 Treat_{i,t} + \partial_3 Post_{i,t}xTreat_{i,t} + \partial_4 ResWin_{i,t} + \partial_5 GC_{i,t} + \partial_6 FirmSize_{f,t} + \partial_7 Leverage_{f,t}$$
$$+ \partial_8 SalesGrowth_{f,t} + \partial_9 BTM_{f,t} + \partial_{10} \Delta GSP_{s,t} + \partial_{11} Rep\_Gov_{s,t} + \partial_{12} Rep\_Lgst_{s,t} + \partial_{13} CorpTR_{s,t}$$
$$+ \varphi FirmFE + \varepsilon_{i,t} \tag{3}$$

where *Treat* is an indicator variable equal to one if the state where the firm is headquartered changed its individual income tax rates by two percent or more and zero if the state did not change its tax rates during the sample period. There are 12 events where the state individual income tax rates changed by two percent or more between 2000 and 2019. Seven are increases (CA, HI, IL, MN, NJ, NY, OR), and five are decreases (MO, HI, NC, RI, UT). Hawaii appears in both groups, as it first increased and then decreased its tax rates. Our control sample (*Treat* = 0) consists of firms headquartered in 15 states with no changes in individual income tax rates from 2000 to 2019.[21] We include each control state-year only once, even if there is more than one treatment state in a given year. We exclude firms headquartered in states with small changes in income tax rates (i.e., less than two percent) to ensure a clear separation between the treatment and control firms.

In Equation (3), *Post* is an indicator variable that equals zero for the pre-enactment period and equals one (minus one) for the post-enactment period for tax rate increases (decreases). We set *Post* equal to minus one for tax rate decreases to align the predicted signs on coefficients for increases and decreases. We define the pre-enactment (post-enactment) period as the two years before (after) each tax rate change less the three months immediately before (after) each change. We exclude the six

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[21] These states are AL, AK, FL, LA, MS, NV, NH, SC, SD, TN, TX, VA, WV, and WY.

months centered on the enactment date because insiders may delay or accelerate their trades upon learning about the new tax rules.[22] We predict ∂_3 to be positive.

Table 6 presents results from estimating the model in Equation (3) for all of the tax rate changes as well as separate results for the tax rate increases and decreases. Due to the limited sample size for insider purchases, we present our findings for all transactions. We estimate a statistically significant positive coefficient on *Treat x Post* in all columns. The coefficients are 0.0404 and 0.0528 in the full models using the all-executives and CEOs samples, respectively. Based on the median annual insider trading size of $435,528 in this sample, the sum of coefficients on *Post* and *Post x Treat* suggests that the abnormal insider trading profits change by $16,047 for all executives following a two percent or larger change in state income tax rates. The median insider's compensation subject to income taxes for this sample is $1,952,920. Therefore, ignoring any deductions or contributions and using the average absolute income tax rate change (3.3%), the same insider's tax liability changes by $64,446. Thus, we estimate that the median insider uses insider trading to offset 24.8% (=$16,047/$64,446) of the tax effects. For CEOs, the same calculation suggests an effect size of 16.8% (=$20,633/$122,964). Thus, the economic magnitudes are comparable to those in our main analyses. The coefficient on *Post* is statistically insignificant in full models, indicating that abnormal trading profitability is unaffected in control states. Overall, our findings in Table 6 support our conclusion that abnormal trading profitability increases (decreases) following increases (decreases) in tax rates.

5.3.2. Changes in abnormal insider trading profitability around the American Taxpayer Relief act

Our main analyses focus on state, rather than federal, tax rate changes for two reasons. First, changes in the federal tax laws affect all insiders in the United States, making it difficult to control the effects of other macroeconomic changes. Second, such changes often modify multiple aspects of the tax code or coincide with other significant changes in federal laws. Despite these drawbacks, federal tax rate changes typically alter individual tax rates significantly and thus are worthy of a closer examination.

During our sample period, there were three major federal tax rate changes: the Jobs Growth and Tax Relief Reconciliation Act of 2003 (JGTRRA), the American Taxpayer Relief Act of 2012 (ATRA), and the Tax Cuts and Jobs Act of 2017 (TCJA). The JGTRRA significantly reduced dividend tax rates and coincided with the passage of the Sarbanes-Oxley Act, both of which may affect incentives for insider trading. As such, it is not possible to rule out that these other factors did not alter insider trading around the JGTRRA. The ATRA was enacted as a partial resolution to avoid the fiscal cliff, which could have led to substantial cuts in Medicaid payments and benefits. It primarily altered income and capital gains tax rates. While the act may have been anticipated, there is little to suggest that the other provisions in the act or events surrounding the act have significantly altered incentives for insider trading. The TCJA included major changes to individual and business tax codes ranging from adjustments to or elimination of deductions and exemptions to changes in corporate and individual income tax rates. These changes could plausibly impact executives' compensation packages and their trades. Thus, of these three tax acts, the ATRA offers the cleanest setting to examine the impact of federal tax rate changes on insider trading profitability, and we extend our analyses to examine its effects.

Congress enacted the ATRA on January 2, 2013. It increased the federal individual income tax rate by creating a net top marginal tax rate bracket at 39.6% (previously 35%) and raised the capital gains tax rate from 15% to 20%. As detailed in Section 2.1, capital gains taxes are a secondary consideration for a typical insider since most of an insider's compensation is subject to income taxes. However, a significant change in capital gains taxes can be a nontrivial concern when a large portion of the insider's portfolio is subject to these taxes. For example, an insider can face a large capital gains tax burden if their shares derive from an option exercise and the market price of the shares significantly appreciates between the exercise and sale dates.

All else being equal, an increase in capital gains taxes reduces after-tax trading profits for insiders. Consequently, insiders benefit less from trading on private information while facing the same risks. To consider the most extreme case, if capital gains were taxed at a 100% rate, insiders would have no incentive to trade on private information as doing so would entail legal risks without any benefits. Thus, we expect that a change to capital gain taxes in the same direction as a change in the income tax rate would attenuate the effect of the income tax rate change on insider trading profitability. In the context of the ATRA, this suggests that the average abnormal insider trading profits should increase following the ATRA but that this effect should be diminished among executives who face a steep capital gains tax burden.

To test these predictions empirically, we estimate the following model:

$$Abn\_TrdProfits_{i,t} = \alpha + \eta_1 Post_{i,t} + \eta_2 HighCG_{i,t} + \eta_3 Post_{i,t} xHighCG_{i,t} + \eta_4 ResWin_{i,t} + \eta_5 GC_{i,t} + \eta_6 FirmSize_{i,t}$$
$$+ \eta_7 Leverage_{i,t} + \eta_8 SalesGrowth_{i,t} + \eta_9 BTM_{i,t} + \varphi FirmFE + \varepsilon_{i,t} \tag{4}$$

where *Post* is an indicator variable equal to one if the trade occurs following the ATRA and zero if it occurs before the ATRA. Like our state tax rate change tests, we focus on the four years surrounding the ATRA while omitting the three months immediately before and after the event. That is, the pre-enactment period is from January 1, 2010, to September 30, 2012, and the post-enactment period is from March 1, 2013, to December 31, 2015.

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[22] For example, Dai et al. (2008) suggest that in the two weeks before a decrease (increase) in capital gains taxes asset prices can experience a capitalization effect that decreases (increases) demand or a lock-in effect that decreases (increases) supply.

Table 6

Changes in abnormal insider trading profitability around state tax rate changes. This table presents coefficient estimates from GLS regressions of *Abn_TrdProfits* on *Post*, *Treat*, *Post x Treat*, and control variables using the Lewis and Linzer (2005) adjustment for estimated dependent variables. *Post* is equal to zero for the pre-enactment period and is equal to one (minus one) for the post-enactment period for tax rate increases (decreases). A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. t-statistics are reported in parentheses and are based on standard errors clustered by firm and transaction date.***,**, and* indicate statistical significance at a two-sided 1%, 5%, and 10% level, respectively.

| | All Executives | | | | | | CEOs | | | | | |
| | All Changes | | Increases | | Decreases | | All Changes | | Increases | | Decreases | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Post	−0.0073**	−0.0033	−0.0038	−0.0041	−0.0046	−0.0024	−0.0129**	−0.0039	−0.0082	−0.0089**	−0.0031	−0.0004
	(−2.17)	(−1.17)	(−0.85)	(−1.12)	(−1.18)	(−0.73)	(−2.40)	(−1.00)	(−1.47)	(−2.13)	(−0.57)	(−0.09)
Treat	−0.0087		−0.0072		−0.0066		−0.0090		−0.0073		0.0081	
	(−1.34)		(−0.95)		(−0.58)		(−0.94)		(−0.66)		(0.39)	
Post x Treat	**0.0261***	**0.0404***	**0.0213**	**0.0388***	**0.0340*	**0.0834*	**0.0226*	**0.0528***	**0.0171	**0.0571***	**0.0399*	**0.0907**
	(2.93)	**(3.38)**	**(2.09)**	**(3.04)**	**(1.83)**	**(1.70)**	**(1.94)**	**(2.99)**	**(1.35)**	**(3.07)**	**(1.73)**	**(2.06)**
ResWin		−0.0026		−0.0044		−0.0029		−0.0223**		−0.0221*		−0.0211*
		(−0.43)		(−0.63)		(−0.45)		(−2.25)		(−1.90)		(−1.90)
GC		0.0021		0.0034		0.0084		0.0163		0.0169		0.0293*
		(0.23)		(0.31)		(0.90)		(1.14)		(1.07)		(1.96)
FirmSize		−0.0445***		−0.0452***		−0.0524***		−0.0426***		−0.0439***		−0.0485***
		(−5.31)		(−4.42)		(−4.99)		(−3.54)		(−3.25)		(−2.89)
Leverage		−0.0452		−0.0365		0.0087		−0.0325		−0.0232		0.0519
		(−0.92)		(−0.57)		(0.20)		(−0.46)		(−0.27)		(0.69)
SalesGrowth		0.0538***		0.0499***		0.0435**		0.0575***		0.0510**		0.0320
		(3.33)		(2.73)		(2.38)		(2.71)		(2.20)		(1.24)
BTM		−0.0720***		−0.1010***		−0.0560**		−0.0496		−0.0845***		−0.0283
		(−3.26)		(−4.35)		(−2.43)		(−1.63)		(−2.65)		(−0.90)
ΔGSP		−0.0542		−0.1091		0.0206		−0.0213		−0.2052		0.1365
		(−0.37)		(−0.72)		(0.12)		(−0.11)		(−1.03)		(0.61)
Rep_Gov		0.0031		0.0028		0.0010		0.0222		0.0271		0.0076
		(0.24)		(0.19)		(0.07)		(0.99)		(1.15)		(0.33)
Rep_Lgst		−0.0264**		−0.0255*		−0.0197		−0.0442**		−0.0422**		−0.0339
		(−1.99)		(−1.92)		(−1.27)		(−2.24)		(−2.19)		(−1.62)
CorpTR		−0.0189**		−0.0210**		−0.0030		−0.0158		−0.0172		−0.0074
		(−2.31)		(−2.09)		(−0.14)		(−1.50)		(−1.21)		(−0.39)
Obs. count	57,347	57,347	40,692	40,692	32,175	32,175	28,887	28,887	21,090	21,090	15,900	15,900
Adjusted R²	0.001	0.176	0.001	0.195	0.001	0.178	0.002	0.233	0.001	0.245	0.000	0.236
Firm FE	−	✓	−	✓	−	✓	−	✓	−	✓	−	✓

In Equation (4), *HighCG* is an indicator variable equal to one for insiders in the top tercile of capital gains tax burden and zero otherwise. We use the tax basis of shares held by each insider, which we estimate following Yost (2018), as our measure of the capital gains tax burden. The lower the basis, the higher the portion of compensation subject to capital gains taxes, relative to income taxes. We predict a positive coefficient on *Post* ($\eta_1 > 0$) and a negative coefficient on *Post x HighCG* ($\eta_3 < 0$).

Table 7 presents the results from estimating the model in Equation (4). As predicted, the coefficient on *Post* is positive and statistically significant in all columns. In column (2), using all executives, we find a significant increase in abnormal trading profits following the ATRA. Column (4) shows that the effect of ATRA is weaker among executives with relatively high capital gains tax burdens. The sum of the coefficients on *Post* and *PostxHighCG* is statistically not different from zero, suggesting that the ATRA had a negligible impact on the trading profits of executives with high capital gains tax burdens. These conclusions also hold for CEOs, though the interaction term is statistically insignificant. Overall, the evidence indicates that the enactment of the ATRA is associated with higher abnormal trading profitability and that this effect is diminished for executives with higher capital gains tax burdens.

5.4. An alternative measure of abnormal insider trading profitability

In this section, we re-run our analyses using an alternative measure of insider trading profitability following Skaife et al. (2013), which takes insiders' trading volume into account and is calculated as follows:

$$PROFIT\%_{f,t} = \left(\frac{\sum_{j=1}^{n} ABRET_{f,t,j} * VALUE\_BOUGHT_{f,t,j} - ABRET_{f,t,j} * VALUE\_SOLD_{f,t,j}}{MV_{f,t-1}} \right) * 100$$

where $ABRET_{f,t}$ is the size adjusted buy-and-hold abnormal return on firm *f* for 365 days starting one day after transaction date *j*, $VALUE\_BOUGHT_{f,t,j}$ ($VALUE\_SOLD_{f,t,j}$) is the total dollar value of shares bought (sold) by all insiders on day *j*, *n* is the total number of firm-days with insider trading during firm-year *ft*, and $MV_{f,t-1}$ is the market value of equity at the end of fiscal year *t-1*.

Table 8 presents the estimates from the regression where we regress *PROFIT%* on state income tax rate and control variables. Column (1) presents the results with controls for state characteristics and fixed effects. Column (2) adds controls for firm characteristics related to insider trading from Skaife et al. (2013).[23] In both samples, we find a positive and statistically

Table 7

The enactment of ATRA and abnormal insider trading profitability. This table presents coefficient estimates from GLS regressions of *Abn_TrdProfits* on *Post*, its interaction with *HighCG*, and control variables using the Lewis and Linzer (2005) adjustment for estimated dependent variables. *Post* is equal to zero for the ATRA pre-enactment period and is equal to one for the ATRA post-enactment period. A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. t-statistics are reported in parentheses and are based on standard errors clustered by firm and transaction date.***,**, and* indicate statistical significance at a two-sided 1%, 5%, and 10% level, respectively.

	All Executives				CEOs			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post	0.0239***	0.0367***	0.0520***	0.0532*	0.0351***	0.0528***	0.0459**	0.0634*
	(2.67)	(3.13)	(2.87)	(1.72)	(2.68)	(2.79)	(2.02)	(1.78)
HighCG			0.0269**	0.0063			0.0183	−0.0798**
			(1.97)	(0.28)			(1.06)	(-2.21)
Post x HighCG			−0.0334	−0.0421**			−0.0119	−0.0187
			(-1.64)	(-2.09)			(-0.44)	(-1.19)
ResWin		0.0138		0.0151*		0.0229		0.0265*
		(1.53)		(1.66)		(1.50)		(1.70)
GC		−0.0163		−0.0153		−0.0145		−0.0126
		(-0.64)		(-0.61)		(-0.40)		(-0.35)
FirmSize		−0.0346		−0.0295		−0.0193		−0.0124
		(-1.36)		(-1.16)		(-0.55)		(-0.36)
Leverage		−0.1708		−0.1800		−0.2398		−0.2458
		(-1.45)		(-1.55)		(-1.46)		(-1.56)
SalesGrowth		−0.0342		−0.0322		−0.0711		−0.0732
		(-0.98)		(-0.93)		(-1.41)		(-1.49)
BTM		−0.1432***		−0.1593***		−0.1544**		−0.1651**
		(-2.89)		(-3.21)		(-2.23)		(-2.37)
Post + *Post x HighCG* = *0*			0.0186	0.0111			0.0340	0.0447
			(0.41)	(0.30)			(0.93)	(1.32)
Obs. Count	22,366	22,366	22,366	22,366	11,634	11,634	11,634	11,634
Adjusted R^2	0.004	0.264	0.006	0.266	0.008	0.308	0.009	0.311
Firm FE	−	✓	−	✓	−	✓	−	✓

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[23] For consistency, we use the same control variables as Skaife et al. (2013). Our inferences remain identical if we use the firm-level control variables from our main analyses instead.

Table 8
An alternative measure of insider trading profitability. This table presents coefficient estimates from OLS regressions of *PROFIT%*, the alternative measure of insider trading profits based on Skaife et al. (2013) on *StateITR* and control variables. A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. t-statistics are reported in parentheses and are based on standard errors clustered by firm.***,**, and* indicate statistical significance at a two-sided 1%, 5%, and 10% level, respectively.

	All Executives		CEOs	
	(1)	(2)	(3)	(4)
StateITR	**0.0023*****	**0.0020*****	**0.0025*****	**0.0022*****
	(4.16)	**(3.55)**	**(3.76)**	**(3.28)**
ΔGSP	−0.0122	−0.0116	0.0325	0.0309
	(-0.30)	(-0.29)	(0.65)	(0.62)
Rep_Gov	0.0023	0.0022	0.0015	0.0013
	(1.55)	(1.55)	(0.87)	(0.74)
Rep_Lgst	0.0009	0.0010	−0.0010	−0.0009
	(0.39)	(0.43)	(-0.34)	(-0.29)
CorpTR	0.0011	0.0009	0.0011	0.0008
	(0.84)	(0.73)	(0.69)	(0.50)
MICW		0.0054*		0.0125***
		(1.74)		(3.18)
Lag_MV		−0.0008*		−0.0006
		(-1.79)		(-1.18)
Lag_BTM		−0.0009		0.0017
		(-0.57)		(0.82)
Lag_BHAR		−0.0007		−0.0040***
		(-0.56)		(-2.65)
Ln(NumEst)		0.0008		0.0005
		(1.10)		(0.54)
FSInform		−0.0125***		−0.0099***
		(-5.49)		(-3.49)
R&D		0.0029		0.0046**
		(1.59)		(2.05)
Inst		−0.0044**		−0.0042
		(-1.98)		(-1.57)
Ln(Age)		0.0004		0.0000
		(0.55)		(0.01)
RetVol		0.4464***		0.3778***
		(4.35)		(3.16)
Mag_AR		−0.0947**		−0.1279***
		(-2.24)		(-2.63)
Obs. count	41,307	41,307	28,953	28,953
Adjusted R^2	0.019	0.027	0.019	0.026
State FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓

significant coefficient on *StateITR*, which ranges between 0.0020 and 0.0025. To estimate the change in total abnormal insider trading profits in response to a one percentage point change in tax rates, we multiply the estimate in the full model in column (2) by the median market firm capitalization ($626 million) and divide by 100. Dividing this estimate by one percent of the median insider compensation subject to income taxes ($1.864 million) times the median number of insiders per firm (i.e., four) yields 16.8%. Thus, we estimate that executives offset 16.8% of the tax effect by adjusting their abnormal trading profits, which is comparable to our estimates from the main analyses. Overall, these findings confirm the inferences from our main analyses and indicate that our findings are not specific to the abnormal insider trading profitability measure that we employ in our main analyses.

5.5. State tax rates and insider trading volume

An insider can increase their total trading profits by earning greater abnormal returns through more aggressive use of private information or by conducting larger trades for a given level of private information. The insider's choice depends on the benefits and costs of each option. Using more private information allows insiders to hold onto more of the shares they own (or spend less to acquire shares) at the cost of an increased risk of detection. Increasing trade size requires insiders to sell more shares (or spend more to acquire shares). This may increase the risk of detection but presumably not as much as increasing the use of private information. These two levers are not mutually exclusive, and our results so far speak to executives' use of one of them. In this section, we expand our analysis and examine whether insider trading volume is associated with state tax rates.

Table 9
State tax rates and insider trading size. This table presents coefficient estimates from OLS regressions of *Volume* on *StateITR* and control variables. Columns (1)–(6) present results for trades of all executives, and columns (7)–(12) present them for only CEOs. Results are presented for all transactions, as well as sales and purchase transactions, separately. A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. t-statistics are reported in parentheses and are based on standard errors clustered by firm and year.***,**, and* indicate statistical significance at a two-sided 1%, 5%, and 10% level, respectively.

	All Executives						CEOs					
	All Transactions		Sales		Purchases		All Transactions		Sales		Purchases	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
StateITR	0.0007	0.0002	0.0001	−0.0004	0.0007	0.0005	0.0021	−0.0013	−0.0002	−0.0002	0.0013	0.0008
	(0.32)	(0.09)	(0.04)	(−0.14)	(0.43)	(0.32)	(0.87)	(−0.49)	(−0.08)	(−0.08)	(0.38)	(0.25)
StateITRxHighSH		0.0026*		0.0022		0.0018		0.0005		−0.0000		0.0057*
		(1.66)		(1.22)		(1.14)		(0.30)		(−0.01)		(1.83)
HighSH		−0.0352***		−0.0424***		−0.0110		−0.0266**		−0.0329***		−0.0282*
		(−3.55)		(−3.83)		(−1.38)		(−2.51)		(−2.70)		(−1.91)
FirmSize	−0.0543***	−0.0539***	−0.0683***	−0.0679***	−0.0166***	−0.0165***	−0.0469***	−0.0464***	−0.0644***	−0.0639***	−0.0169***	−0.0169***
	(−25.33)	(−25.11)	(−27.94)	(−27.68)	(−13.21)	(−13.21)	(−18.99)	(−18.77)	(−21.28)	(−21.03)	(−8.49)	(−8.35)
Leverage	−0.0528***	−0.0530***	−0.0456**	−0.0447**	0.0552***	0.0549***	−0.0405**	−0.0404**	−0.0172	−0.0148	0.0536***	0.0532***
	(−3.05)	(−3.06)	(−2.27)	(−2.22)	(5.91)	(5.87)	(−2.24)	(−2.23)	(−0.76)	(−0.66)	(3.68)	(3.62)
SalesGrowth	0.2714***	0.2705***	0.3041***	0.3022***	−0.0330***	−0.0329***	0.1957***	0.1938***	0.2130***	0.2089***	−0.0350***	−0.0353***
	(16.75)	(16.74)	(16.11)	(16.06)	(−3.62)	(−3.61)	(10.62)	(10.54)	(9.32)	(9.16)	(−2.58)	(−2.61)
BTM	−0.0863***	−0.0876***	−0.0851***	−0.0863***	0.0284***	0.0283***	−0.0646***	−0.0664***	−0.0371**	−0.0383**	0.0230***	0.0233***
	(−8.86)	(−8.96)	(−6.25)	(−6.34)	(6.43)	(6.40)	(−6.06)	(−6.21)	(−2.34)	(−2.42)	(3.63)	(3.65)
ΔGSP	0.1865	0.1856	0.1711	0.1775	−0.1023	−0.1064	0.1744	0.1763	0.0618	0.0694	−0.0466	−0.0465
	(1.13)	(1.13)	(0.87)	(0.91)	(−0.95)	(−0.99)	(0.90)	(0.91)	(0.26)	(0.30)	(−0.24)	(−0.24)
Rep_Gov	0.0030	0.0028	0.0084	0.0082	0.0002	0.0002	0.0129*	0.0130*	0.0201**	0.0205***	0.0024	0.0025
	(0.50)	(0.46)	(1.21)	(1.18)	(0.05)	(0.05)	(1.93)	(1.95)	(2.56)	(2.60)	(0.35)	(0.36)
Rep_Lgst	−0.0027	−0.0026	−0.0081	−0.0078	0.0027	0.0025	−0.0043	−0.0040	−0.0080	−0.0074	0.0006	0.0002
	(−0.27)	(−0.26)	(−0.69)	(−0.66)	(0.41)	(0.39)	(−0.40)	(−0.37)	(−0.60)	(−0.56)	(0.05)	(0.02)
CorpTR	0.0034	0.0031	0.0028	0.0023	−0.0018	−0.0018	0.0040	0.0038	0.0027	0.0024	0.0005	0.0002
	(1.20)	(1.09)	(0.82)	(0.69)	(−0.66)	(−0.69)	(1.34)	(1.27)	(0.70)	(0.65)	(0.11)	(0.05)
HoldSize	1.2721***	1.2508***	1.1318***	1.0963***	0.5831***	0.5820***	1.7756***	1.7538***	1.7924***	1.7562***	0.4815***	0.4825***
	(12.25)	(12.03)	(9.86)	(9.51)	(8.34)	(8.32)	(13.91)	(13.72)	(12.52)	(12.23)	(5.82)	(5.85)
Obs. count	23,287	23,287	19,889	19,889	5420	5420	15,372	15,372	12,463	12,463	3219	3219
Adjusted R²	0.209	0.209	0.228	0.229	0.186	0.187	0.228	0.229	0.255	0.257	0.187	0.189
State FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

For this analysis, we estimate the following model at the firm-year level:

$$\begin{aligned} Volume_{f,t} = {} & \alpha + \beta_1 StateITR_{f,t} + \beta_2 FirmSize_{f,t} + \beta_3 Leverage_{f,t} + \beta_4 SalesGrowth_{f,t} + \beta_5 BTM_{f,t} + \beta_6 \Delta GSP_{s,t} \\ & + \beta_7 Rep\_Gov_{s,t} + \beta_8 Rep\_Lgst_{s,t} + \beta_9 CorpTR_{s,t} + \beta_{10} HoldSize_{s,t} + \delta StateFE + \varphi YearFE \\ & + \psi IndustryFE + \varepsilon_{f,t} \end{aligned} \quad (5)$$

where the dependent variable (*Volume*) is the natural logarithm of one plus the total annual volume of shares traded by insiders scaled by the average number of shares outstanding. We include *HoldSize*, the number of shares held by insiders as a percentage of shares outstanding at the beginning of the year, as an additional control variable to this analysis. Since insiders may adjust their trade sizes more easily when they have larger shareholdings, we also run a modified model where we interact *StateITR* with *HighSH*, an indicator variable equal to one if the firm is in the top tercile in terms of its executives' average shareholdings (where average shareholdings is defined as the dollar value of shareholdings as a percentage of total compensation). To the extent that insiders use trading volume to adjust their trading profits, we expect the coefficients on *StateITR* and *StateITRxHighSH* to be positive and statistically significant.

Table 9 presents the results from this analysis. When included without the interaction term, the coefficient on *StateITR* generally has a positive sign but is not statistically significant. Similarly, the interaction term *StateITRxHighSH* has a positive sign but is either insignificant or marginally statistically significant. Thus, while insider trading volume may be positively associated with income tax rates, the relation is statistically weak. These findings suggest that insiders adjust their profitability primarily through profits per share rather than trade size.

5.6. State tax rates and legal risk

Insiders derive more utility from insider trading profits when they face higher income tax rates. Consistent with this notion, our evidence shows that insiders are willing to trade more aggressively under high tax regimes, which may expose them to greater legal risks. In this subsection, we extend our analyses to examine the relation between income tax rates and the SEC's insider trading enforcement actions to explore how tax-driven changes affect the legal risk of abnormal insider trading profits.

Using data on SEC insider trading enforcement actions from Blackburne et al. (2021), we investigate the relation between state income tax rates and the annual number of SEC insider trading enforcement actions against firms headquartered in the state. In Table 10, we test this relation, controlling for the state economic conditions and the number of firms headquartered in each state (*FirmCount*). The first column in Table 10 presents the results using all state years. In this column, we find that the annual number of SEC enforcement actions in a state is positively and statistically significantly associated with the state income tax rate. The relation is economically significant as well. Given that the mean number of SEC enforcement actions per state-year is 16.824 in our sample, the coefficient on *StateITR* (0.9381) suggests that each percentage point increase in state tax rates is associated with 5.6% more enforcement actions relative to the mean.

Table 10
State tax rates and SEC enforcement actions. This table presents coefficient estimates from OLS regressions of the annual number of SEC enforcement actions against firms headquartered in a given state (*NumofEA*) on *StateITR* or *Post*, *Treat*, *Post x Treat*, and control variables. *Post* is equal to zero for the pre-enactment period and is equal to one (minus one) for the post-enactment period for tax rate increases (decreases). A detailed definition of each variable is available in Appendix B. All continuous variables are winsorized at the top and bottom one percentile. t-statistics are reported in parentheses and are based on robust standard errors.***,**, and* indicate statistical significance at a two-sided 1%, 5%, and 10% level, respectively.

	All State-Years	Around Tax Rate Changes		
		All Changes	Increases	Decreases
StateITR	**0.9381****			
	(2.38)			
PostxTreat		**6.1941*****	**8.8935*****	**5.0899***
		(2.84)	**(3.49)**	**(1.71)**
Post		0.7723	0.3364	0.0602
		(0.97)	(0.34)	(0.06)
Treat		−0.1076	−5.6494**	3.6224***
		(-0.06)	(-2.05)	(2.60)
FirmCount	0.1012***	0.1235***	0.1254***	0.1278***
	(13.96)	(62.07)	(49.17)	(24.92)
ΔGSP	−28.2652	−1.1199	15.5979	−4.2731
	(-1.36)	(-0.06)	(0.66)	(-0.32)
Rep_Gov	3.6654**	−3.1007***	−3.3695**	−3.2724***
	(2.39)	(-2.98)	(-2.47)	(-4.10)
Rep_Lgst	2.3339**	2.5626**	1.7888	2.3644***
	(2.55)	(2.37)	(1.28)	(2.79)
CorpTR	−54.4356**	−23.6469	−22.3375	−12.6125
	(-2.35)	(-1.64)	(-1.22)	(-1.12)
Obs. Count	1000	513	343	320
Adjusted R^2	0.697	0.902	0.908	0.910
Year FE	✓	−	−	−

Columns 2, 3, and 4 focus on changes in SEC enforcement actions around tax rate changes of two percent or more. Similar to our analysis in Table 6, we define *Post* as an indicator variable that is equal to zero for the pre-enactment period and is equal to one (minus one) for the post-enactment period for tax rate increases (decreases). We define the pre-enactment (post-enactment) period as the two years before (after) each tax rate change. The control group (*Treat* = 0) consists of firms headquartered in 15 states with no changes in individual income tax rates from 2000 to 2019.

The second column in Table 10 presents the results for all tax rate changes. In this column, we find a positive and statistically significant coefficient on the interaction of *Post x Treat*. Considering that the mean number of SEC enforcement actions per state-year among treatment states is 50.37, the coefficient on the interaction term (6.1941) suggests that a two percent or greater increase in state tax rates is associated with about a 12.3% increase in SEC enforcement actions. We examine tax rate increases and decreases separately in the third and fourth columns. The results suggest that the SEC enforcement actions are significantly associated with both tax rate increases and decreases. The statistical and economic significance of the results are somewhat stronger for increases. Overall, these results confirm that SEC enforcement actions vary predictably with state income tax rates, and they complement our main findings that state income tax rates influence insiders' incentives to use private information in their trades.

6. Conclusion

Research finds that executives bear the consequences of changes in individual tax rates, as there is little adjustment to their compensation following tax rate changes. We conjecture that to counteract the effects of income taxes on their compensation, executives alter their use of private information in their trades. We use panel data analysis and event studies to investigate the relation between abnormal insider trading profitability and state income tax rates. We find that abnormal insider trading profitability is positively associated with tax rates, and several factors influence this relation. We also show that the capital gains tax rate, which typically applies to a small portion of insiders' compensation, is negatively associated with insiders' incentives to trade on private information. We find weak evidence of an association between insider trading volume and tax rates. This result indicates that executives primarily adjust their per share profitability to counteract the effects of taxes on their net compensation. Finally, consistent with more aggressive insider trading under higher tax regimes leading to higher legal risks, we observe that the SEC enforcement actions are positively associated with state tax rates.

Our findings suggest that possibly illegal or unethical insider trades are more prevalent in high tax regimes. Considering the dynamic nature of tax laws, our findings highlight an unintended consequence of taxes on executive behavior and suggest a spillover effect of individual tax rates. Our study also contributes to the extensive literature on the determinants of insider trading profitability. Most of this literature examines the effects of information asymmetry and restrictions limiting insiders' ability to trade profitably. We provide evidence of a systematic and time-varying exogenous factor, individual-level taxes, that affects insiders' incentives for using private information in their trades.

Appendix A. Changes in state individual income tax rates from 2000 to 2019

Appendix B. Variable definitions

Variable name	Description
Abn_TrdProfits	The average daily risk-adjusted stock return to insider purchases (sales) calculated as the intercept (negative of the intercept) from the Fama and French (1993) and Carhart (1997) four-factor model that is estimated over the 180 days following the day of the transaction.
StateITR	The highest individual marginal income tax rate in the state where the company is headquartered.
ResWin	Indicator variable equal to one if the trade occurred during the 48 days starting 46 days before and ending a day after an earnings announcement date and zero otherwise.
GC	Indicator variable equal to one if the firm has a general counsel on its board of directors and zero otherwise.
FirmSize	The natural logarithm of total assets (AT).
Leverage	Debt (DLTT + DLC) scaled by total assets (AT)
SalesGrowth	Current period sales (SALE) minus prior year sales scaled by prior year sales.
BTM	Book value of equity (CEQ) scaled by the market value of equity (CSHO x PRCC_F).
ΔGSP	Percentage change in annual gross state product for the state where the firm is headquartered.
Rep_Gov	Indicator variable equal to one if the state where the firm is headquartered has a Republican governor and zero otherwise.
Rep_Lgst	Indicator variable equal to one if the state where the firm is headquartered has a majority Republican legislature and zero otherwise.
CorpTR	The highest combined federal and state corporate income tax rate in the state where the firm is headquartered.
LowComp	Indicator variable equal to one if the firm is in the bottom tercile in terms of average executive compensation and zero otherwise. Average compensation is calculated as the mean of the top five executives' total compensation in the fiscal year prior to the observation year as reported in Execucomp. Terciles are calculated separately for each year.
LowSH (HighSH)	Indicator variable equal to one if the firm is in the bottom (top) tercile in terms of the average value of shares held by executives and zero otherwise. The average value of shares is calculated as the mean shareholdings of the top five executives multiplied by the share price at the end of the fiscal year and scaled by the average executive compensation as reported in Execucomp. Terciles are calculated separately for each year.
LowSH w/HB	Indicator variable equal to one if the firm is in the bottom tercile among firms with low shareholdings (LowSH) in terms of its executives' average capital gains tax burden. We estimate the capital gains tax burden following Yost (2018). Terciles are calculated separately for each year.
NoICW	Indicator variable equal to one if the firm does not have an internal control weakness in the last three years based on data from the Audit Analytics database and zero otherwise.
LowMisconduct	Indicator variable equal to one if the firm is in the bottom tercile in terms of the aggregate dollar value of penalties incurred for regulatory violations in the last three years and zero otherwise. We obtain penalty data from the Good Jobs First dataset and aggregate penalties for each firm over the three years leading up to the tax rate change scaled by ending total assets. Terciles are calculated separately for each year.
LowMedia	Indicator variable equal to one if the firm is in the bottom tercile of media coverage and zero otherwise. We measure media coverage as the number of articles/press releases for the firm adjusted for the industry median coverage over the observation year. Terciles are calculated separately for each year.
LowAF	Indicator variable equal to one if the firm is in the bottom tercile of analyst coverage and zero otherwise. We calculate analyst coverage as the number of analysts following the firm during the observation year. Terciles are calculated separately for each year.
HighRD	Indicator variable equal to one if the firm is in the top tercile of R&D activities, and zero otherwise. We measure R&D activities as annual R&D expenditures (XRD) scaled by total assets (AT) at the end of the observation year. Terciles are calculated separately for each year.
HighBA	Indicator variable equal to one if the firm is in the top tercile of the bid-ask spread and zero otherwise. Bid-ask spread is calculated as the average daily bid-ask spread over the observation year. Terciles are calculated separately for each year.
Post	Indicator variable equal to zero for the pre-enactment period and equal to one (minus one) for the post-enactment period for tax rate increases (decreases). The pre-enactment (post-enactment) period is defined as the two years before (after) each tax rate change.
Treat	Indicator variable equal to one if the state the firm is headquartered at had a tax rate change of two percent or more, and zero otherwise.
PROFIT%	The measure of abnormal profits calculated following Skaife et al. (2013).
Volume	The natural logarithm of one plus the annual number of shares traded by insiders as a percentage of average common shares outstanding.
HighCG	Indicator variable equal to one if the firm is in the top tercile in terms of the average insider capital gains tax burden and zero otherwise. We follow Yost (2018) and calculate the insider tax burden as the total tax liability from the sale of all vested stock divided by the total value of the CEO's stock and option holdings.
HoldSize	The natural logarithm of one plus the total number of shares held by insiders as a percentage of common shares outstanding at the beginning of the period.
NumofEA	The aggregate number of SEC enforcement actions related to insider trading against all firms in the state.
FirmCount	The number of firms headquartered in the state.

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