Who bears the costs of the corporate income tax? Evidence from state tax rate changes and firm-level accounting data[†]

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ABSTRACT

We use a staggered difference-in-differences design around state corporate income tax rate changes to examine the incidence of the corporate income tax on a variety of the firm's stakeholders. Tax incidence theory suggests that corporate income taxation affects the supply of capital, resulting in changes to firm output and demand for the firm's inputs (Harberger 1962), while other studies suggest that shareholders alone bear incidence (Gravelle and Smetters 2006). We predict and find that corporate tax rate increases reduce equity financing and firm investment, causing a drop in firm output and imposing tax burden on the firm's consumers. We also predict and find that the reduction in output reduces demand for the firm's inputs, imposing tax burden on suppliers and employees. Next, we predict and find that firms increase their tax avoidance activities in non-state jurisdictions in response to the tax rate increase, imposing tax burden on other governments. We find no evidence that shareholders bear any tax burden. We also test whether stakeholders benefit from tax decreases, but find evidence of benefit only for employees and only when tax rate decreases are relatively large. Our study contributes to the literature on the incidence of the corporate income tax.

***Keywords*:** Corporate tax incidence, accounting data, state tax rate changes

1. INTRODUCTION

In this study, we aim to identify who bears the costs and benefits of corporate income taxes. Policymakers, practitioners, and academics have grappled with the incidence consequences of the corporate income tax but have found mixed results (see e.g., Arulampalam, Devereux and Maffini 2010; Cochrane 2017; Mankiw 2017; Fuest, Peichl and Sieghloch 2018 for recent analyses). Recent commentary echoes this confusion and suggests that corporate income tax incidence remains an enigma (Auerbach 2006). Prior literature primarily focuses on the effects of corporate taxation on the taxed firm's shareholders and employees (Fuest et al. 2018).[2] We expand the potential set of stakeholders that bear incidence to consumers, suppliers and other governments, while also incorporating employees and the taxed firm's shareholders. To our knowledge, studies examining corporate income tax incidence on suppliers, governments and consumers are sparse. (Goolsbee [1998] and Kopczuk, Marion, Muehlegger and Slemrod [2013] examine suppliers, but focus on *non-corporate* tax incidence). Furthermore, prior literature hardly explores these questions using firm-level data which is often richer than aggregate data and allows for more powerful tests.

Consistent with the public economics literature, we define tax incidence as the change in welfare due to a change in taxes (Fullerton and Metcalf 2002; Black, Hashimzade and Myles 2012). Therefore, incidence may result from either (1) a change in the transaction price of a good, (2) a change in the quantity transacted of a good or (3) both. For example, assume the corporate income tax results in incidence on consumers. Consumers will (1) face a higher price to purchase

[2] In addition, our study is consistent with prior literature on implicit taxes but is distinct in that we focus on changes in input prices and quantity demanded rather than pre-tax returns. Contrastingly, implicit taxes focus on the implicit taxes on inputs that corporations use and the resulting effects on pre-tax returns (e.g. Wilkie 1992, Jennings, Weaver and Mayew 2012). For example, Jennings et al. (2012) find evidence consistent with corporate taxes reducing pre-tax returns and suggest this decrease is due to higher input prices. Contrastingly, we focus on the consequences of the corporate income tax to the taxed firm's stakeholders. That is, we focus on the changes in input prices and quantity demanded induced by corporate tax changes. Thus, our study is consistent with studies on implicit taxes but is distinct in that we focus on changes in input prices and quantity demanded rather than pre-tax returns.

the good, (2) purchase fewer goods or (3) some combination of (1) and (2). In any of these three cases, consumers lose welfare after the imposition of the tax.[3]

Our hypotheses are consistent with the theory found in Harberger (1962) and reviewed in Auerbach (2006) but differ in that we include consumers, suppliers and other governments as potential bearers of incidence.[4] We hypothesize that consumers, suppliers, and other governments in addition to labor (employees) and capital (shareholders) bear some incidence from state corporate income tax rate increases because increasing the corporate income tax rate reduces the after-tax returns to shareholders.[5] Lower after-tax returns to shareholders reduces the supply of equity capital to the firm as some shareholders and potential shareholders no longer receive their required return. As a result, firms issue less equity, reduce investment, reduce their output, and demand less supplies and labor. Output prices rise because of the decreased output. Supply costs and labor costs decline because of the decreased demand for the firm's inputs. As a result, consumers, suppliers, employees and shareholders bear incidence.[6,7]

Moreover, we expect that firms will avoid more taxes following a statutory rate increase. Firms' choose a sustainable effective tax rate that weighs the costs and beenfits of tax avoidance.

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[3] This analysis assumes that demand for corporate goods and services is not perfectly elastic. In other words, consumers cannot perfectly substitute towards non-taxed sectors and remain as satisfied as they were when they had the option of consuming corporate goods and services.

[4] Auerbach (2006) reviews several theories on the incidence of the corporate income tax. All of the reviewed theories assume or conclude that capital flows to the taxed sector decrease to varying degrees due to the tax. However, the incidence of the corporate income tax on shareholders depends on portfolio allocations in equilibrium, substitution between equity and debt and the shareholder-level tax rate.

[5] We use state tax changes rather than federal tax changes for several reasons. First, state-level corporate income taxes offer more cross-sectional and intertemporal variation in statutory tax rates than federal-level corporate income taxes. Second, we use state statutory tax rate changes in our difference-in-differences regressions as plausibly exogenous shocks to firm tax liabilities. By focusing on plausibly exogenous shocks, we reduce the likelihood that observed responses in outcome variables represent the effects of omitted variables.[5] Further, we rely on the fact that not all states change their tax rates at the same time for our difference-in-differences tests. Thus, we increase power and reduce potential bias by using state tax expense.

[6] Our explanation abstracts away from important assumptions for the sake of simplicity. However, we note that the mobilities of capital and labor and price elasticities facing the firm will also affect incidence.

[7] We assume that stakeholders suffer from tax increases (i.e. bear incidence) if they cannot contract with taxed firms and must contract more with non-taxed firms due to the tax increase. A tax increase induces stakeholders to contract with the untaxed sector more than they preferred doing before the tax change and imposes transaction costs on stakeholders (e.g. consumers have to find a new store or supplier). Thus, stakeholders are left worse off from a tax change.

Several costs associated with tax avoidance depend on the overall level of the firm's effective tax rate – e.g., political costs and reputation concerns. A statutory tax rate increase mechanically raises the firm's effective tax rate, making increased tax avoidance less costly with respect to ETR-levels based tax costs. If firms avoid more taxes in other reporting jurisdictions, other governments will also bear incidence.

Additionally, we examine whether incidence is asymmetric. Specifically, we examine whether these same set of stakeholders obtain the *benefits* of state corporate income tax rate decreases. A reduction in statutory tax rates increases the return to shareholders for a given amount of pretax income, increasing the supply of equity capital available to the firm. At the margin, the increased availability of financing capital incentivizes firms to issue equity, increase investment, and increase output. The increase in supply of the firm's outputs reduces the selling prices, enhancing consumer welfare. The increase in firm output implies that the firm will demand more inputs, driving prices up and enhancing the welfare of the firms' suppliers and employees. Firms are also predicted to avoid less non-state taxes; the statutory rate reduction reduces firm ETRs and increases the political/reputation costs of incremental tax avoidance. If firms reduces tax avoidance activities in response to a state tax rate decrease, then non-state governments will have benefitted from the state tax rate decrease.[8]

We use firm-level income statements to identify incidence on the various stakeholders. The income statement captures the following identity:

$$Net\ Income = Revenue - COGS - SGA - Interest - Nonstate\ Taxes - State\ taxes$$

[8] Tax incidence need not be symmetric. That is, stakeholders that bear the costs of tax rate increases need not necessarily recoup the gains of tax decreases. Shareholders might prefer to withhold the benefits of lower corporate taxes for themselves. Moreover, firms might be unwilling or unable to renegotiate contractual obligations that provide favorable prices for inputs (such as supply or labor contracts) that were struck under the assumption of higher taxes. Thus, tax incidence might exhibit asymmetric behavior with respect to increases and decreases.

If state tax rate increases are associated with changes to the firm's income statement accounts, this implies a change to the welfare of the stakeholder related to that account.[9] We attribute stakeholder welfare to the income statement as follows: revenues measure incidence on consumer/customers; cost of goods sold expense measures incidence on suppliers; sales, general, and administrative expense measures incidence on employees; non-state income taxes measure incidence on non-state governments; and net income measures the incidence on shareholders.[10] As an example, if shareholders bore the full burden of a tax rate increase we would expect to see a reduction in net income associated with the increase but no changes to the other accounts. Similarly, we would conclude that consumers bear tax incidence if a state tax rate increase results in a revenue decrease.[11]

We estimate difference-in-differences regressions on a sample which contains firms experiencing state tax rate increases and decreases to examine whether tax incidence is asymmetric with respect to increases and decreases. In these regressions, our treated group comprises firms headquartered in states that increased or decreased corporate income tax rates in the current year or a prior year.[12] Our control sample consists of firms headquartered in states that have not yet raised or decreased corporate income taxes and also firms that will never experience a corporate income tax rate increase or decrease during our sample period. We then perform generalized

[9] We assume that stakeholders in firms cannot costlessly switch towards the non-corporate sector. For example, we expect that suppliers suffer if COGS decreases because suppliers face frictions (e.g. lower prices, search costs) in switching to non-corporate buyers of their goods.
[10] We scale each of our dependent variables by lagged total assets.
[11] If revenues increase (and the increase is significantly different from zero), we would still infer that consumers bear incidence because prices rose and output fell. If the magnitude of the price rise exceeds the magnitude of the output drop, revenues would still rise. Therefore, the change in revenues is a function of elasticities in the market.
[12] We use firms' headquarter states because firms have nexus in their headquarter states. Moreover, firms likely have substantial contacts to their headquarter states and thus apportion much of their state income taxes to their headquarter states. In additional analysis, we use establishment level data to identify nexus and estimate apportionment.

difference-in-differences regressions to identify the marginal effect of a state tax change on the various income statement line items.[13]

Our first results are consistent with state corporate income tax rate increases *decreasing* equity issuances.[14] Specifically, we find that equity issuances (the number of shares sold by firm *i* in year *t* multiplied by the selling price of those shares) and net equity issuances (equity issuances reduced by share repurchases) are negatively and significantly associated with state tax rate increases in a difference-in-differences framework. Therefore, our results support the assumption that increases to the corporate income tax rate reduce the supply of equity capital to firms. Interestingly, we find that the relationship is asymmetric: while tax rate increases reduce equity issuances, tax decreases have no significant association with equity issuances.

Next, we find that state tax rate increases are negatively associated with investment, measured using capital expenditures and research and development expense. Along with our prior results, this result is consistent with tax rate increases decreasing equity financing which in turn reduces firm-level investment. Thus, this result is consistent with traditional corporate income tax incidence theory (e.g. Harberger 1962). However, we do not find an association between tax decreases and either of our investment variables.

In our main test, we implement difference-in-differences regressions around state corporate income tax rate increases to identify incidence. We find results consistent with consumers, suppliers, and employees bearing the burden of the corporate income tax. Specifically, we find that sales, COGS, SG&A, and non-state taxes decrease following an increase to state tax rates. We find no association between state tax rate increases and shareholder welfare (earnings). In these

[13] Bertrand and Mullainathan (2003) employ the same approach to test whether governance shocks affect managerial preferences.

[14] Tax rate changes can induce firms to trade-off debt for equity or vice versa. However, firms do not likely *perfectly* substitute debt for equity for reasons proffered in the capital structure literature (e.g., higher debt induces higher bankruptcy costs, etc.). Therefore, investment should fall following a tax increase.

same regressions, we also test whether state tax *decreases* enhance the welfare of various stakeholders. We find no association between state tax decreases and revenues, cost of goods sold, SG&A, non-state taxes or earnings. Thus, our results are consistent with consumers, suppliers, non-state governments and shareholders receiving none of the benefits of a corporate income tax decrease.

We suspect that our main findings of incidence asymmetry may be partially driven by small tax decreases. Tax cuts may have little or no effect on our various dependent variables because they are mostly small in magnitude.[15] To address this possibility, we perform the same difference-in-differences regressions but use only state tax rate decreases of 1% or more. With these specifications, we find null results except that corporate income tax decreases are significantly associated with increases in SG&A. This result is consistent with employees and/or other suppliers benefitting from tax rate decreases.

In our cross-sectional tests, we identify variables likely to affect the tax burden borne by each stakeholder. First, we hypothesize that tax rate increases reduce revenues more when the firm operates in an elastic product market compared to an inelastic product market. Second, we hypothesize that market power increases incidence on suppliers by nudging output levels towards monopsonistic levels following tax rate increases. Third, we hypothesize that union membership increases incidence on labor because tax rate increases reduce economic rents captured by union members via bargaining while also decreasing the demand for labor. Fourth, we hypothesize that tax rate increases lead to more incidence on non-state governments among firms engaging in risky tax avoidance because tax rate increases will encourage firms with high tax risk tolerance to avoid non-state taxes. Thus, firms engaging in risky tax avoidance will increase non-state tax avoidance more than firms engaging in less risky tax avoidance following tax rate increases. Finally, we

[15] Small tax decreases may also explain asymmetric results found in other studies that use state tax changes (Heider and Ljungqvist 2015; Ljungqvist, Zhang and Zuo 2017).

hypothesize that shareholders at financially constrained firms suffer less from tax rate increases compared to shareholders at other firms because tax changes should not alter the financing and investment of constrained firms as they are already unable to access external financing for investment. In these tests, we also include state tax rate decreases and expect that the results should be symmetric. Our cross-sectional results are broadly consistent with our hypotheses – however, as before, decreases are not fully symmetric.

In our first additional test, we drop firms with overlapping state tax rate increases and decreases and find results consistent with our main results. Next, we confirm that our results are robust to using state tax rate changes in non-headquarter states. We use establishment level data to identify states in which a given firm likely has income tax nexus and which changed its corporate income tax rate in our sample period. We estimate apportionment using employee levels and the number of establishments of a given firm in a given year. Results are generally consistent with our main results, though we find some evidence of shareholders overshifting. Next, we demonstrate that our results are robust to using OLS regressions. In these tests, we use state tax expense as our independent variable rather than tax rate changes to demonstrate that our main results are not driven by omitted variables that are correlated with rate changes (e.g., state macroeconomic factors that our controls do not adequately capture). We find results mostly consistent with our main analyses.

This study contributes to the literature on tax incidence by providing a comprehensive examination of the effects of corporate income tax rate changes on firm stakeholders. To our knowledge, we are the first to examine the effects of tax rate changes on equity issuances – testing an important assumption of general equilibrium corporate income tax incidence theory. Moreover, we expand traditional incidence analyses by examining the effects of tax changes on a broader set of stakeholders. While prior literature identifies incidence effects only on shareholders and, to a

lesser extent, employees, this study aims to identify effect on various corporate stakeholders. To our knowledge, our study is the first to examine corporate income tax incidence effects on suppliers.[16] Furthermore, this study is the first to use firm-level data to identify tax incidence on shareholders, employees and consumers.

Perhaps most importantly, our study provides evidence to policymakers on corporate income tax incidence. Policymakers debated changes to the corporate income tax prior to and following the passage of the Tax Cuts and Jobs Act (TCJA) of 2017. As commenters have noted, incidence was central to these debates because policymakers likely did not intend to impose costs on non-shareholders, but did hope benefits would reach these same stakeholders (Mankiw 2017). Moreover, recent Democratic proposals include provisions *raising* the corporate income tax rate (see e.g., Davison 2018 and Harwood 2018). Thus, we hope this study helps analyze the consequences of TCJA's corporate income tax rate decrease and assists policymakers understand the consequences of potential future corporate income tax rate increases.

2. HYPOTHESIS DEVELOPMENT

Economic tax incidence refers to welfare changes in a market when a tax is imposed on any party in that market (Black, Hashimadze and Myles 2012). In other words, tax incidence refers to extra costs imposed on or benefits received by a party in a market due to changes in tax rates on any party in the same market. For example, firms may reduce output and raise sales prices in response to an increase in tax rates. In this case, consumers bear tax incidence because they pay a higher price and consume fewer units due to the increase in taxes.

In this study, we explore the incidence of the corporate income tax by analyzing changes in state corporate income taxes. We hypothesize that firms pass on tax incidence to various stakeholders because the corporate income tax reduces the after-tax returns of shareholders in a

[16] Goolsbee (1998) and Kopczuk et al. (2013) examine non-income tax incidence on suppliers.

firm facing a tax rate increase.[17] Consequently, shareholders will withdraw or withhold their capital from the firm and instead invest in a firm that does not face a tax rate increase. By doing so, shareholders deprive the firm facing a state tax rate increase of one of its production inputs. Thus, firms decrease their investment and reduce their demand for inputs such as inventory and labor. The prices and the market-clearing quantities of inputs should fall as a result of decreased demand, resulting in tax incidence on these various inputs. Moreover, the firm will reduce its overall output, resulting in decreased supply to the market and higher prices.[18] Under this theory, shareholders, suppliers, consumers and labor might all bear incidence.

Symmetrically, income tax *decreases* should benefit shareholders, suppliers, consumers and employees because tax cuts increase after-tax returns to shareholders. Therefore, shareholders should provide capital to firms with low tax rates by purchasing such firms' equity. At the margin, firms should increase their investment because of the increased access to capital. At the same time, firms should purchase more supplies and employ more labor to increase production. As a result, consumers benefit from increased supply and lower prices. Increased sales also increase profits. Therefore, tax decreases benefit consumers, suppliers, labor and shareholders.

Our study is closely related to the literature on implicit taxes. Implicit taxes refer to lower pre-tax investment returns to tax-favored assets (Scholes, Wolfson, Erickson, Hanlon, Maydew and Shevlin 2015). Implicit taxes arise because taxation of an asset causes the prices of untaxed assets to rise. In equilibrium, the expected pre-tax returns of untaxed assets falls due to this price increase. This decrease is referred to as an implicit tax. Several studies examine whether corporations face implicit taxes due to variation in the tax treatments of production inputs. For example, Wilkie (1992) finds evidence consistent with tax subsidies being associated with lower

[17] Our theory is consistent with conventional theory on the corporate income tax incidence. See e.g. Harberger (1962); Gravelle (2013).

[18] We assume that stakeholders cannot perfectly substitute towards the non-corporate sector. Put differently, we assume that reduction in output or demand for inputs from corporations reduces overall output and demand for inputs.

pre-tax earnings. Jennings et al. (2012) find that implicit taxes faced by corporations decreased following the Tax Reform Act of 1986.

Our study and incidence analyses generally are consistent with this literature on implicit taxes faced by corporations. If we find that corporate income taxation affects input prices, we could infer that explicit corporate income taxation imposes implicit taxes on inputs because their prices rise (Chyz, Luna and Smith 2016). In this spirit, Jennings et al. (2012) note that implicit taxes facing a corporation are "…a special case of the incidence of corporate income taxes." However, studies focusing on the implicit taxes faced by corporations are different from incidence studies because implicit tax studies focus on price changes where incidence studies focus on welfare changes.

We examine incidence on various stakeholders because firms contract with each of these stakeholders and could plausibly pass on the tax burden. Jensen and Meckling (1976) argue that a corporation can be viewed as a "nexus" of contracts between various stakeholders of the firm – shareholders, labor, suppliers, customers, governments (and perhaps other stakeholders, though we do not consider them in this study). Therefore, each of these various stakeholders will bear incidence if the corporate income tax affects demand for their good or service.

We begin by testing whether state tax changes affect equity issuances, as assumed by many incidence models (Harberger 1962; Gravelle 2013). Corporate income taxes reduce after-tax returns to shareholders. Therefore, in equilibrium, firms' equity issuances should vary with corporate income taxes because firms with high corporate income taxes have less access to equity capital than untaxed firms at the margin. We predict that corporate income tax rate increases will reduce equity issuances because investors will be marginally less willing to supply capital in the

face of reduced returns. As our rationale is symmetric, we expect that corporate tax rate decreases will increase the supply of equity financing.[19] [20] Thus, our first hypothesis is as follows:

H1: *Firms increase (decrease) equity issuances following state corporate income tax decreases (increases).*

Second, we expect that firms' investment changes following state tax rate increases. Incidence theory posits that changes in equity issuances affect marginal firm-level investment which reduces input demand and output supply, thus leading to incidence. Thus, we expect marginal investment to decrease following tax rate increases and increase following tax decreases. Thus, our second hypothesis is as follows:

H2: *Firms increase (decrease) investment following state corporate income tax decreases (increases).*

Our next hypotheses posit that the various stakeholders identified previously bear incidence. If corporate income taxes cause the firm's equity financing and investment to decline, we expect this to cause a drop in the firm's output and potentially affect relations with various stakeholders. When the firm's output quantity falls, economic theory suggests that prices for the firm's output will rise. This implies that consumers will bear some of the tax burden in the form of higher prices and foregone transactions.

Prior literature explores tax incidence on consumers (e.g. Fullerton and Metcalf 2002).[21] For example, McClure (1981) considers the incidence of state corporate income taxes in a

[19] We do not examine the relation between corporate income taxes and debt financing because prior studies demonstrate a positive relation between taxes and corporate debt usage (e.g. Heider and Ljungqvist 2015; Graham 2003 provides a review).

[20] Firms will not fully substitute changes in equity issuance with debt issuance because increased debt imposes costs. For example, firms will not perfectly substitute debt for equity following a tax rate increase because high levels of debt increase bankruptcy costs (as noted in Graham 2003). Moreover, increased demand for debt will increase the cost of debt supplied to firms. Thus, overall financing will fall following tax rate increases.

[21] Depending on produc-market conditions, firms will not raise their prices to recover lost after-tax profits in response to a tax rate increase in equilibrium. If firms did so, their price would be higher than their competitors' prices and they would be unable to sell their output.

theoretical setting. He argues that state residents bear the incidence of the tax – as workers, landowners, capital owners and, to an extent, consumers. Empirically, Gordon (1967) and Krzyzaniak and Musgrave (1963) find that firms pass on the full burden of a corporate income tax to consumers. More recently, Hassett and Mathur (2015) use a spatial model and find little incidence on consumers. These studies use aggregate data to identify effects, while we use firm-level data and natural experiments to identify effects on consumers. Thus, our tests should be more powerful than those used prior studies on consumer incidence. Our hypothesis is as follows:

H3: *Consumers bear the incidence of the corporate income tax.*

A similar rationale applies to the taxed firm's employees. Harberger (1962) theoretically demonstrates that labor doesn't bear incidence because labor can costlessly shift to untaxed sectors where demand for labor is unbounded. However, empirical results are inconsistent with Harberger's theoretical results. Arulampalam et al. (2012) finds evidence that labor does bear some tax costs in a European setting. We expect labor to bear incidence because our theory predicts that changes in taxes affect investment which changes the demand for labor. For example, if corporate income taxes rise, firms will invest less because they are less able to access equity financing. They will employ fewer workers or pay workers less, resulting in incidence on labor. This leads to our second hypothesis:

H4: *Employees bear the incidence of the corporate income tax.*

Following our predictions regarding employees, reduced production at the taxed firm will reduce the demand for all inputs – labor and supplies. Hence, we expect to identify tax incidence on suppliers due to the reduced demand for their supplies.

Prior literature supports this expectation. Goolsbee (1998) finds that firms pass on the tax benefits from an investment tax credit to suppliers while Kopczuk et al. 2013 find that excise tax incidence is borne along a supply chain. Similarly, Brown, Fee and Thomas (2009) suggest that

firms pass on costs associated with leveraged buy outs (not taxes) to suppliers in the form of reduced cost of goods sold.

H5: *Suppliers bear the incidence of the corporate income tax.*

We also hypothesize that firms pay less (more) non-state income taxes when their state income taxes increase (decrease) because increased (decreased) state income taxes alter the optimal level of non-state tax avoidance. We expect that firms choose a sustainable effective tax rates that weighs the costs and benefits of tax avoidance. Costly aspects of tax avoidance include reputation costs and political costs (Watts and Zimmerman, 1978). Such costs likely depend on the overall level of the firm's effective tax rate (ETR). Raising the statutory tax rate mechanically increases the firm's ETR, making tax avoidance less costly. Therefore, we expect firms to reduce their non-state tax payments in response to state tax rate increases. Symmetrically, we expect firms to pay more in non-state taxes when their state taxes *decrease*. The firm's current level of tax avoidance becomes more costly due to the reduction in ETR. Consequently, firms' optimal level of tax avoidance should decrease as state tax rates fall. Our sixth hypothesis is as follows:

H6: *Other governments bear the the incidence of the corporate income tax.*

If the firm is unable to pass on tax costs to the other stakeholders, then the incidence of the tax will fall on the firm's current shareholders. Tax incidence falls on shareholders if they suffer from lower after-tax returns following a tax rate increase. Some prior literature finds that shareholders bear the full incidence of the corporate income tax (e.g. Harberger 1962; Mankiw 2006; Serrato and Zidar 2016). As such, our seventh and final hypothesis is as follows.

H7: *Current shareholders bear the incidence of the corporate income tax.*

In addition, we make cross-sectional hypotheses on incidence for each stakeholder in section 5 to validate that our measures are indeed picking up tax incidence on the various stakeholders.

3. EMPIRICAL DESIGN

3.1. Sample

Our sample consists of firm-year observations for publicly-traded firms with data on Compustat. In our main tests, our sample spans 1989 to 2012 (due to the state tax change data provided in Heider and Ljungqvist 2015). We remove financial services firms and utilities because their operating decisions are restricted by regulators. We remove firms headquartered outside the United States or in Guam, Puerto Rico and the Virgin Islands. We remove observations with missing total assets, negative book value of equity or with missing head quarter states. Finally, we drop all observations with missing values for our dependent and control variables. We collect headquarter data from Bill McDonald's website (available at https://www3.nd.edu/~mcdonald/). We collect state-level economic data from the St. Louis Federal Reserve's Economic Data (FRED) database. All variables are winsorized at the 1st and 99th percentiles.

In implementing our difference-in-differences regressions, we rely on the state tax rate increases and decreases identified in Heider and Ljungqvist (2015) (see Appendix A and B in Heider and Ljunqvist 2015). We use 43 state corporate income tax rate increases across 24 states and 78 state corporate income tax cuts across 27 states. Our first treatment event occurs in 1989 and our last occurs in 2011. On average, state tax rate increases raise rates by 93 basis points and state tax decreases lower rates by 55 basis points on average (both numbers are consistent with Heider and Ljungqvist 2015).

In practice, firms must apportion their USA domestic income to the various states on the basis of property, payroll, and sales located within each state. Our specification – following Heider and Ljungqvist (2015) – assumes that firms have increased exposure to the state tax rate imposed by their headquarter state. We do not estimate apportionment to each state in our main tests. We believe that headquarter state tax rate changes accurately capture firms' state tax rate exposure for

several reasons. First, the presence of a headquarters guarantees nexus within the headquarter state due to the presence of employees and property within the headquarter state. Sales alone is not enough to trigger nexus within a state. Second, there is anecdotal evidence of firms relocating their headquarters to another state where state taxes are reported to be a factor in the decision (Peters 2005; Strauss-Kahn and Vives 2009; Chow, Huang, Klassen and Ng 2018). Such anecdotal evidence suggests that, at least for some firms, headquarter state taxes are a material consideration. The final – and perhaps most compelling – reason why we believe that the headquarter state adequately captures state tax rate exposure is the robustness checks performed in Heider and Ljungqvist (2015). The authors developed a measure to approximate firm apportionment across the various states and compared their results obtained with that measure to the headquarter state tax rate change estimates. The authors obtained nearly identical point estimates between the two measures and concluded: "Focusing on home-state tax changes thus appears to be an innocuous approximation" (Heider and Ljunqvist, 2015, p. 697).

3.2. Incidence Measures

We rely on income statement line items to detect incidence on various stakeholders.[22] First, revenues aggregate the price that consumers pay and the quantity of output they consume and serve as our measure of consumer welfare. We predict that output will fall and prices will rise, but we cannot predict the direction of the change in revenues as it depends on the relative magnitude of the price and quantity changes. However, a reduction in supply reduces consumer welfare regardless, so we interpret any change in revenues associated with a tax rate increase as a reduction in consumer welfare.[23] We make a similar prediction with regards to a state tax decrease – an

[22] One caveat to our analysis is that we are only measuring incidence on public firms and their stakeholders. To the extent that private firms react differently to tax rate changes, our analyses may not be generalizable to the aggregate economy.

[23] We assume (1) that a reduction in output from the corporate sector is not perfectly offset by an increase in output from the private sector and/or (2) that stakeholders cannot perfectly substitute towards the non-corporate sector. If either assumption is true, consumers suffer welfare losses from corporate income tax rate increases. Both assumptions

increase in supply of the firm's output raises quantity and reduces price and could result in higher or lower revenues for the firm. As such, we treat any changes to revenue associated with a tax rate decrease as consumer welfare enhancing.

Second, cost of goods sold represents the welfare on suppliers. Cost of goods sold (COGS) is loosely the expense firms pay for inventory (quantity times price) and related expenses. If firms demand less inventory from their suppliers, the price and quantity of supplies transacted will both fall. Therefore, we are able to make a directional prediction for this item – suppliers bear incidence of a tax rate increase if the tax increase is associated with a reduction in COGS. An inverse argument applies for state tax rate decreases – an increase in demand for supplies by the taxed firm causes both the price and quantity of transacted supplies to increase. Hence, we interpret an increase in COGS associated with state tax reductions as welfare enhancing for the firm's suppliers.

Third, we use SG&A expense to represent employee welfare. We acknowledge that SG&A expense includes many operating expenses, but contend that wages are likely a large portion of SG&A. Moreover, prior studies use SG&A to capture employee wages (Babenko and Tserlukevich 2009; Bova, Kolev, Thomas and Zhang 2015). Similar to COGS expense, we interpret increases (decreases) in SG&A associated with tax rate decreases (increases) as welfare enhancing (reducing) for the firm's employees.

We use non-state taxes to represent incidence on non-state governments, including the federal government, foreign governments and local governments. If non-state governments bear incidence, we expect firms to avoid more non-state taxes and firms' non-state tax expense to

seem innocuous based on prior studies. Ljungqvist and Smolyanksy (2018) find results consistent with corporate taxes reducing overall income and employment, thus suggesting that the private sector does not fully offset reductions in employment and output induced by corporate tax rate increases.

decrease. Finally, we use net income to represent shareholder welfare because net income represents after-tax returns available for distribution to shareholders.

3.3. Methodology

3.3.1. Equity financing effects

Our first test examines the effect of state tax changes on equity financing. We implement difference-in-differences regressions to test whether tax rate increases and decreases affect the amount of firms' equity financing. We estimate the following regression:

$$Equity\ Financing_{it} = \alpha + \beta_1 Increase_{it} + \beta_2 Decrease + \sum \beta_k Controls_{it} + \epsilon_{it} \quad (1)$$

Equity Financing is defined in two ways. First, we use *net* equity issuances following Chang et al. (2006). Net equity issuances are the proceeds from the sale of common stock minus the amount of share repurchases. Second, we use *gross* equity financing. Gross equity issuances are the proceeds from sale of common stock and ignores any share repurchases. *Increase* takes a value of 1 if firm *i* experienced a corporate income tax rate increase in its headquarter state in year *t* or prior to year *t*.[24,25] *Decrease* is coded to 1 if the state that firm *i* is headquartered in decreased corporate income taxes in year *t* or a prior year. We include both *Increases* and *Decreases* in our regressions following the approach in Heider and Ljungqvist (2015). By doing so, we control for the effects of a tax decrease (increase) when examining the effects of a tax rate increase (decrease) on equity financing. β_1 represents the effect of a state tax rate increase on equity financing relative to equity financing at firms that do not experience state tax rate increases and relative to equity financing at firms that experience a state tax rate increase later in the sample period (i.e. β_1 represents the difference-in-differences estimate of a state tax rate increase on equity financing, as noted in Bertrand and Mullainathan 2003). We expect β_1 to be negative and significant, consistent

[24] Following Heider and Ljungqvist (2015), we do not limit our pre- and post-periods.

[25] We examine only the first corporate income tax rate increase and decrease in a state. By construction, *Tax rate increase* (*Tax Decrease)* takes a value of 1 for any subsequent state tax rate increase that occurs during our sample because *Tax rate increase* is coded to 1 following the first state tax rate increase.

with corporate income tax rate increases decreasing equity issuances. Similarly, β_2 is the difference-in-differences estimate of a state tax decrease on equity issuances. We expect β_2 to be positive and significant, consistent with firms issuing more equity financing after a corporate income tax decrease.

Controls is a vector of fixed effects and firm-level controls that affect equity financing decisions. We control for state, year and firm fixed effects to remove any invariant effects that can confound our results. We control for firms' book-to-market (*Book-to-market)* ratio because firms issue more equity when their shares are overvalued (Chang, Dasgupta and Hilary 2009). We control for common dividends (*ComDiv*) because firms with more shares will issue more total dividends. We control for SG&A (*SG&A)* because growth firms can have higher SG&A expenses and also issue more equity. Firm earnings may affect the likelihood of a tax increase and may affect the firm's equity issuance policy; we control for earnings (*Earnings*) although we make no directional prediction for this variable. We control for tax avoidance (*CETR3)* because firms issue more as they avoid taxes (Lee, Shevlin and Venkat 2018). We control for leverage (*Leverage)* because firms with high leverage may prefer equity to debt (Chang et al. 2009). We control for size (*ln(Assets))* because larger firms issue more equity (Chang et al. 2009). We control for intangibles (*Intangibles)* and PP&E (*PP&E(Net)*) because firms issue more equity to finance intangible development (Chang et al. 2009; Goh, Lee, Lim and Shevlin 2016) and investment. We control for foreign income (*Foreign Income*) as foreign earnings may generate earned capital that is trapped overseas and thus will require domestic equity issuances. Finally, we control for net operating losses *(NOL)* because the marginal benefits of debt decline as firms have more non-debt tax shields, such as NOL's (Goh et al. 2016). Thus, they should prefer to issue equity. We also control for two state-level economic variables. First, we control for the state's economic growth rate (*GSP Growth*) because growth rates can induce state legislatures to change corporate income

taxes and can also affect equity financing decisions. Second, we control for the state's unemployment rate (*Unemployment*) because state legislatures often change taxes in response to unemployment (Ljungqvist et al. 2017). Furthermore, unemployment can affect firms' decision to issue equity financing because high unemployment suggests that economic conditions are poor thus will deter firms from issuing equity financing to fund investment. We cluster standard errors by firm and year to preclude time-series or cross-sectional correlation from affecting our inferences.

3.3.2. Investment effects

In our second test, we examine whether state corporate income tax changes affect investment. We implement difference-in-differences regressions using state corporate income tax changes as exogenous shocks to corporate income taxes. Our specification is as follows:

$$Investment_{it} = \alpha + \beta_1 Increase_{it} + \beta_2 Decrease + \sum \beta_k Controls_{it} + \epsilon_{it} \quad (2)$$

We measure *Investment* in two ways. Both measures are consistent with prior studies (e.g. Hanlon, Lester and Verdi 2015). First, we use capital expenditures scaled by lagged total assets (*CapEx*). Capital expenditures are a common form of investment. Thus, we expect firms to alter capital expenditures following corporate income tax changes. Second, we use research and development expenses scaled by lagged total assets (*R&D*). R&D is another important form of investment.[26] Thus, we expect R&D to change as corporate income taxes change. Specifically, we expect β_1 to be negative and significant because we hypothesize that tax rate increases reduce investment. We expect β_2 to be positive and significant because we hypothesize that tax decreases reduce investment. *Increase, Decrease* and *Controls* are defined in the same way they were defined in equation (1).

[26] Research and development is a function classification that may include wages, capital expenditures, overhead, and other natures of costs related to research activities. This does not affect our inferences in our use of R&D as a measure of investment.

3.3.4. Incidence analyses

We employ a difference-in-differences methodology to test for incidence. *Increase* and *Decrease* are defined as before.[27] We estimate whether state statutory corporate income tax rate increases and decreases are associated with other income statement accounts:

$$Revenue_{it} = \beta_0 + \beta_1 Increase_{it} + \beta_2 Decrease + \sum \beta_k Controls_{it} + \varepsilon_{it} \quad (3)$$

$$COGS_{it} = \beta_0 + \beta_1 Increase_{it} + \beta_2 Decrease + \sum \beta_k Controls_{it} + \varepsilon_{it} \quad (4)$$

$$SG\&A_{it} = \beta_0 + \beta_1 Increase_{it} + \beta_2 Decrease + \sum \beta_k Controls_{it} + \varepsilon_{it} \quad (5)$$

$$Non - state\ Taxes_{it} = \beta_0 + \beta_1 Increase_{it} + \beta_2 Decrease + \sum \beta_k Controls_{it} + \varepsilon_{it} \quad (6)$$

$$Net\ Income_{it} = \beta_0 + \beta_1 Increase_{it} + \beta_2 Decrease + \sum \beta_k Controls_{it} + \varepsilon_{it} \quad (7)$$

Revenue is defined as sales scaled by lagged total assets. *COGS* is defined as cost of goods sold scaled by lagged total assets. *SG&A* is defined as firms' sales, general and administrative expenses scaled by lagged total assets. *Non-state Taxes* is defined as total tax expense reduced by state tax expense scaled by lagged total assets. Net income is defined as net income scaled by lagged total assets.

If β_1 is negative in equation (3), our results would be consistent with state tax rate increases decreasing revenues. We would interpret this result as suggesting that consumers bear the incidence of the state tax rate increase because the average price of the sold good rises by less than the decrease in quantity sold. If β_1 is positive, we would still interpret the result as consistent with consumers bearing incidence because the average price of sold goods rises by more than the decrease in quantity sold. Therefore, we conduct two-sided t-tests on β_1 to reflect our non-directional alternative hypothesis. In all other regressions, we perform one-sided t-tests because we proffer directional hypotheses. In equations (4) and (5), we expect a negative and significant

[27] In unreported analyses, we remove all firm-years that experienced both a tax rate decrease and tax rate decrease in a prior year. In these tests, our sample only includes observations in which the firm experienced a rate decrease, a rate increase or neither. Our results are qualitatively and quantitatively unchanged.

β_1 because we hypothesize that a tax rate increase results in fewer supply purchases, fewer employees hired and falling prices for supplies and labor overall.[28] In equation (6), we expect a negative β_1 because firms should pay less nonstate taxes as their state tax bills rise. Similarly, we expect β_1 in equation (7) to be negative because a state tax rate increase should result in falling profits for shareholders.

In these regressions, *Controls* comprises 1) firm-specific control variables, 2) state-specific control variables, 3) year fixed effects, 4) firm fixed effects and 5) state fixed effects. We incorporate state and year fixed effects because both are required in a generalized difference-in-differences framework. We control for firm fixed effects to control for any invariant firm-specific effects that might explain our results. We use a parsimonious set of firm-specific controls to avoid confounding our results. Our theory is broad: we suggest that corporate income tax rate increases result in lower equity issuances, lower investment and, ultimately, incidence on various stakeholders. Therefore, common control variables can lead to overcontrol issues (see Swanquist and Whited 2018 for a discussion of appropriate controls). Still, we incorporate firm-level controls to demonstrate that our results are robust and for consistency with prior studies in accounting. We specifically control for firms' leverage, foreign income, property, plant equipment and size. Each variable is lagged by a year to mitigate the possibility that they confound our results. We also control for two state-level economic variables. First, we control for the state's economic growth rate (*GSP Growth*) because growth rates can induce state legislatures to change corporate income taxes and can affect sales and expenses. Second, we control for the state's unemployment rate (*Unemployment*) because state legislatures may change taxes in response to unemployment. Thus, these state-specific controls at least partially control for state tax policy endogeneity (i.e. that state tax changes are not random).

[28] In some industries, employee wages might be included in cost of goods sold. Thus a negative coefficient estimate on *Increase* might imply incidence on suppliers and employees.

4. RESULTS

4.1. Descriptive Statistics and Correlations

In Table 1, we report descriptive statistics from our sample. *Equity Issuances* and *Net Equity Issuances* have mean values of .105 and .121, respectively. These values suggest firms issue equity between 10.5% and 12.1% of lagged total assets across all firm years. Average *Capex* is around 7.3% of lagged total assets and average *R&D* is around 5.1% of lagged total assets. Average sales amount to 1.382 times lagged assets. Average cost of goods sold amounts to 90.9% of lagged assets while average SG&A amounts to 40.8% of lagged total assets. Non-state taxes take an average value of .019 in our sample, suggesting that the average firm pays 1.9% of its lagged assets in non-state taxes in an average year. Average firm-year after-tax earnings are negative at -3.8% of lagged total assets.

Increase takes a mean value of .309, implying that 30.9% of firm-year observations experience a state corporate income tax rate increase in the current or a prior year. Similarly, *Decrease* takes a mean value of .425 implying that 42.5% of firm-year observations experience a state corporate income tax decrease in the current or a prior year. We are unable to compare our state tax rate increase and decrease summary statistics to Heider and Ljungqvist (2015) because they do not report summary statistics on their state tax change variables.

4.2. Equity financing effects

In Table 2, we report the result of testing our first hypothesis: We predict that tax rate increases (decreases) reduce (increase) equity financing. In column (1), we find that the difference-in-differences estimate on *Increase* is negative and significant at the 1% level when using net equity issuances as our dependent variable. In economic terms, our estimate implies that corporate income tax rate increases reduce equity issuances by 2.1% of total assets relative to equity issuances at firms that never experience corporate income tax rate increases and relative to equity

issuances at firms that have not yet experienced a corporate income tax rate increase. We fail to find evidence that state tax decreases are associated with increased equity issuances as the coefficient on *Decrease* is not significantly different from zero. Thus, the effect of corporate income taxes on net equity issuances appears to be asymmetric. Column (2) verifies that our results are robust to using gross equity issuances – we find that the coefficient on *Increase* is negative and significant at the 1% level. Again, we find no effect of tax decreases on equity issuances.

Our controls are mostly consistent with predictions. We find that the coefficient on book-to-market is negative and significant in columns (1) and (2), suggesting that firms issue more equity when market value of equity is high relative to book value of equity. We find that the coefficient on *ComDiv* is positive and significant, suggesting that firms with more equity issuances have to pay more in dividends. The coefficient on *SG&A* is positive and significant in both columns, consistent with firms issuing more equity as they increase their *SG&A*. *Earnings* is also positively associated with equity issuances in our specification. We find that leverage (*Leverage*) is negatively and significantly associated with equity issuances in both columns, suggesting that firms with more leverage issue less equity. We find that the coefficient on *Intangibles* is positively and significantly associated with equity issuances, consistent with firms issuing more equity as they acquire more intangibles. We find that the coefficient on *PPE(Net)* is positive and significant, consistent with firms issuing more equity when they report large amounts of property, plan and equipment. We find that the coefficient on *Foreign Income* is negative and significant, implying that firms with large levels of foreign income use equity financing less. We also find that state economic growth is associated with firms issuing more equity, consistent with firms financing projects via equity when investment in the state is likely to be profitable due to high economic growth.

These results are novel to the incidence literature in two ways. First, we are the only paper as of this writing to directly examine whether tax rate changes affect equity financing. Incidence theory generally assumes that tax changes affect the supply of capital (Harberger 1962; Gravelle 2013). We are the first to test this explicitly. Second, we offer evidence that tax effects on the supply of capital are asymmetric: tax decreases do not affect equity financing while increases actually reduce equity financing.

4.3. Investment effects

In Table 3, we report the results of testing our second hypothesis – that income tax rate changes are negatively associated with investment. In column (1), we report the results of testing whether corporate income tax rate increases (*Increase*) and decreases (*Decreases*) affect capital expenditures (*CapEx*). We find that the coefficient on *Increase* is negative and significant at the 5% level while the coefficient on *Decrease* is nonsignificant at conventional levels. In economic terms, our estimate of the effect of state tax rate increases on *CapEx* implies that state tax rate increases reduce capital expenditures by 0.3% of total assets. Mean capital expenditures for our sample are 7.3% of total assets (see Table 1) – hence the effect of a tax increase amounts to a 4% reduction in firm capital expenditures. We find no association between state tax decreases and capital expenditures.

In column (2), we report difference-in-differences estimates of the effect of *Increase* and *Decrease* on *R&D.* The coefficient on *Increase* is negative and significant at the 1% level. The observed reduction of 0.006 scaled R&D expense amounts to a 12.5% reduction in R&D expense when compare to the mean value of 0.051 on Table 1. This result is consistent with firms decreasing their research and development expenditures following state tax rate increases. Again, we find no association between state tax decreases and research and development expenses.

Overall, our results are consistent with corporate income tax rate increases reducing investment, as predicted by corporate income tax incidence theory. However, we find that tax decreases have no effect on investment.

4.4. State tax rate increases and decreases

In Table 4, we report the results of examining the incidence of corporate income tax rate increases. We reports estimates from regressions of *Sales, COGS, SG&A, Non-state Taxes* and *Earnings* (respectively) on *Increase* and *Decrease* using a generalized difference-in-differences design. In column (1), we find that *Sales* are negatively and significantly associated with *Increase* at the 1% level. In other words, tax rate increases are associated with reductions in sales. As described previously, we interpret our results as a reduction in firm output and a corresponding increase in price. This is consistent with consumers bearing some corporate income tax incidence. We do not find an effect of *Decrease* on sales, suggesting that consumers do not benefit from tax rate decreases.

In columns (2) and (3), we find that *COGS* and *SG&A* are negatively and significantly related to state tax rate increases. Our results are consistent with a state tax rate increase reducing demand for the firms' inputs, lowering the prices and/or quantity transacted for those inputs. This result implies that suppliers' and employees' welfare is harmed and they bear some of the tax burden. Again, we fail to find suppliers or employees benefitting from decreases to the state corporate income tax rate.

In column (4), we examine the relation between non-state taxes and state tax rate increases and decreases. We find that *Increase* is negatively and significantly related to non-state taxes. This result is consistent with firms avoiding more non-state taxes when facing a corporate income tax rate increase. Thus, our results are consistent with non-state governments, including the federal

government, bearing the burden of a state tax rate increase. We fail to find any evidence that firms avoid less taxes after a tax rate decrease.

Our final result is consistent with shareholders bearing little incidence. We find that earnings are nonsignificantly related to either state tax rate increases or decrease. Specifically, the coefficients on both *Increase* and *Decrease* are nonsignificant when earnings is our dependent variable. We interpret this result as suggesting that shareholders are able to pass on tax rate increases but receive none of the benefits of tax decreases. Moreover, our result is consistent with the results pertaining to *Increase* in columns (1) through (3): while revenues fall following state tax rate increases, COGS and SG&A do as well. Therefore, earnings are not affected by the state tax rate increase. This result is consistent with our theory. Shareholders are able to avoid the incidence of the income tax because potential shareholders withhold capital at the margin (in the case of tax rate increases). If, instead, potential capital-providers invested in the firm, other income statement line items (e.g., sales. COGS. SG&A amd/or non-state taxes) would remain the exact same as would pre-tax income. However, *after*-tax income would be lower due to the increase in state taxes. Thus, new capital providers *would* bear incidence if they invested in the taxed firm at the margin.

Overall, our results are consistent with a wide variety of stakeholders bearing the incidence of corporate income tax rate increases. Specifically, we infer that consumers, suppliers, labor, and other governments all bear some portion of the corporate income tax. Contrary to Harberger (1962), we find that shareholders bear *none* of the incidence, likely because consumers, suppliers and labor are not perfectly mobile and cannot perfectly substitute away from taxed companies. Surprisingly, our results are consistent with incidence asymmetry. That is, our results are consistent with consumers, suppliers, employees, and other governments benefitting little from state tax *decreases* but suffering from tax rate *increases*. This asymmetry is revisited in Section 6.

5. CROSS-SECTIONAL TESTS

We perform one cross-sectional test for each of our dependent variables. We identify variables that we expect to moderate or enhance incidence on each respective stakeholder. We then perform the same difference-in-differences regressions as before but incorporate interactions between *Increase* and a variable that captures cross-sectional variation in incidence on particular stakeholders (*XsecVar*). Each variable is defined below and in Appendix A. We also interact *XsecVar* with *Decrease*. Our results are reported in Table 5.

5.1 Sales – Price elasticity of demand

First, we hypothesize that firms in more elastic product markets experience a greater decrease in revenues than firms in inelastic markets following a tax rate increase. When firms reduce output in elastic markets due to tax rate increases, output will fall by more than prices rise. Contrastingly, output will fall less than prices rise when firms cut output in inelastic markets. Consequently, revenues should fall more following tax rate increases when markets are elastic compared to when markets are inelastic.

To measure elasticity, we split our sample based on industry by estimated elasticity. We use estimates of demand elasticities from Anderson, McLellan, Overton and Wolfram (1997). Anderson et al. 1997 do not provide comprehensive estimates of elasticities across industries. Thus, we rely on intuition to code industries as elastic and inelastic based on their estimates. We code agriculture/mining, transportation and manufacturing as elastic because Anderson et al. 1997 suggest that the markets for fresh tomatoes, air transportation and automobile parts are highly elastic. We code retail trade and services as inelastic because Anderson et al. 1997 suggest salt,

matches and physician and legal services are all inelastic.[29] We expect that the coefficient on the interaction between *Increase* and our elasticity variable is negative.

We report results of this test in column (1) of Table 5. We find that the coefficient on the interaction between *Increase* and elasticity (as represented by *XsecVar*) is negative and significant at the 5% level. We also find that the coefficient on the interaction between *Decrease* and elasticity is positive and significant at the 10% level. These results are consistent with firms in elastic product markets generating lower (higher) sales following tax rate increases (decreases) compared to firms in inelastic markets.

5.2 Suppliers – Market power

Next, we hypothesize that market power increases incidence on suppliers. We expect that firms with market power engaging in imperfect competition will decrease their demand for supplies and inventory towards monopsonistic (single-buyer) levels following tax rate increases. Monopsonistic levels of demand for supplies and inventory reduce supplier welfare to zero. Thus, state tax rate increases on imperfectly competitive firms will reduce supplier welfare more than rate increases on competitive firms. In effect, price and quantity will fall incrementally more when firms are imperfectly competing for supplies and inventory.

We use profit margins to represent market power in supply markets (Kubick, Lynch, Mayberry and Omer 2014). Firms with high markups likely have high market power in supply markets and are thus able to reduce their inventory costs. We expect that the coefficient on the interaction between profit margins and *Increase* is negative.

We report results of this test in column (2) of Table 5. We find that the coefficient on the interaction between *Increase* and profit margins (*XsecVar*) is negative and significant at the 1%

[29] We recognize that mislabeling industry elasticities might introduce noise into our measure. However, comprehensive, industry-wide elasticity estimates are not readily available. In unreported analyses, we use profit margins to measure the price elasticity of demand and find results that are statistically identical to the reported results.

level. We find that the coefficient on the interaction between *Decrease* and profit margins is significant at the 5% level. These results are consistent with tax rate increases reducing the demand of supplies and inventory incrementally more when competition is imperfect compared to when markets are competitive. We also find that tax decreases benefit suppliers when competition is imperfect compared to when markets are more competitive.

5.3 Labor - Union membership

Third, we hypothesize that union membership increases tax incidence on labor based on the findings of Felix and Hines (2009). Felix and Hines argue that union wages are generally higher than non-union wages because union wages represent unions bargaining successfully for the economic rents of the firm. When taxes rise, union workers suffer more than non-unionized workers because they must forego economic rents in addition to bearing incidence from reduced labor demand. Relying on this argument, Felix and Hines (2009) find that the difference between union wages and non-union wages is nearly equal in high-tax states but that union workers are paid substantially higher than non-union workers in low-tax states.[30]

We measure union membership using union density. This measure captures the percentage of total workers that are unionized in a given state in a particular year. We expect the coefficient on the interaction between *Increase* and union membership density to be negative.

Results are reported in column (3) of Table 5. We find that the coefficient on the interaction between *Increase* and union membership density is negative and significant at the 5% level. We find no association between tax rate decreases and *SG&A* at any level of union membership. Our results are consistent with union members bearing more of the costs of tax rate increases but not receiving the benefits of tax decreases.

5.4 Non-state governments - Tax risk

[30] Unionized labor may also bear less incidence. Union contracts may prevent firms from shifting taxes to unionized workers and unions may credibly threaten to protest decreases in wages or layoffs.

Fourth, we hypothesize that firms willing to take more tax risk will increase tax avoidance following tax rate increases compared to firms unwilling to take tax risk. That is, we expect tax rate increases to affect marginal tax avoidance decisions by reducing expected after-tax profits. At the margin, firms will be more willing to take tax risks to avoid taxes to recoup lost profits from the state tax rate increase. We expect that firms willing to take the most tax risk will avoid the most non-state taxes following a tax increase.

We measure risky tax avoidance using the volatility of GAAP effective tax rates. We expect that firms engaging in risky tax avoidance will experience more volatile effective tax rates compared to firms engaging in less risky tax avoidance.[31] We expect that the coefficient on the interaction between the volatility of GAAP ETR and *Increase* is negative.

Our results are reported in column (4) of Table 5. We find that the coefficient on the interaction between *Increase* and GAAP ETR volatility is negative and significant at the 10% level. The coefficient on the interaction between *Decrease* and GAAP ETR volatility is positive and significant at the 1% level. Overall, our results are consistent with the firms willing to engage in the most risky tax avoidance increasing non-state tax avoidance the most following tax rate increases. Symmetrically, we find that firms taking the highest tax risk decrease non-state tax avoidance the most following a tax rate cut.

5.5 Shareholders - Financial constraints

In our last cross-sectional test, we analyze whether financial constraints enhance corporate income tax incidence on shareholders. We hypothesize that shareholders in financially constrained firms bear less of the costs of corporate income tax rate increases because financially-constrained firms are less reliant on external financing compared to other firms. Thus, corporate tax changes

[31] Demere, Lisowsky, Li and Snyder (2016) suggest that GAAP ETR volatility is partially driven by tax risk

should not alter the investment decisions of financially-constrained firms, resulting in less of a decrease in earnings compared to earnings decreases at unconstrained firms.

We measure financial constraints using Altman's Z score (Altman 1968). We code *FinConst* to 1 if a firm's Altman Z score is greater than or equal to 3; we code *FinConst* to 0 otherwise. We expect that the coefficient on the interaction between *FinConst* (i.e. *XsecVar* in Table 5) and *Increase* is negative. Such results would be consistent with shareholders at unconstrained firms reciving more of the costs of a tax rate increase.

We report results in column (5) of Table 5. We find that the coefficient on the interaction between *Increase* and *XsecVar* (i.e. *FinConst*) is negative and significant at the 1% level. The coefficient on the interaction between *Decrease* and financial constraints is positive and significant at the 5% level. Our results are consistent with financially unconstrained firms passing on more of the costs (benefits) of a tax rate increase (decrease) to shareholders compared to financially constrained firms.

6. ADDITIONAL TESTS

6.1 Large tax rate decreases

In this section, we test whether large tax decreases result in incidence. We note that tax decreases seem to have no effect on income statement line items. We suspect that low power explains these null results. Specifically, we note that many of the state tax decreases we use are small in magnitude whereas state tax rate increases are generally large. Many of our corporate income tax cuts reduce corporate taxes by less than .25%. Consequently, state tax cuts might not have any effect or might have only small effects on firm operations. To examine whether tax cut sizes explain our null results, we repeat our analysis but include only large tax decreases (*Big Decrease*) with all state tax rate increases. *Big Decrease* takes a value of 1 if firm *i* is headquarted in a state that decreased corporate taxes by 1% or more in year *t* or in any prior year and 0

otherwise. Thus, *Big Decrease* includes only relatively large tax decreases. Beyond this difference, our specifications are identical to the ones used in our main analyses. Our coefficient predictions are also identical.

We report our results in Table 6. Our results are nearly identical to our prior results, except we now find that *Big Decrease* is positively associated with *SG&*A. Specifically, we find that *Big Decrease* has no effect on sales, COGS, non-state taxes, or net income. However, we find *Big Decrease* has a positive and significant (at the 5% level) effect on *SG&*A in column (3). Our results are consistent with firms using tax savings to pay employees more and/or hire more workers. Thus, our results suggest that employees suffer the costs of tax rate increases, but also benefit from tax decreases. Other stakeholders appear unable to claim the benefits of a tax rate decrease.

6.2 Event study

Next, we use an event-study methodology. This approach provides two benefits. First, the event-study approach identifies treatment effect dynamics. In other words, we are able to observe the magnitude of treatment effects in the periods following treatment. Second, the approach mitigates concerns of non-parallel trends in pre-treatment periods. Our difference-in-differences identification strategy assumes that treated and control firms evolve in parallel but-for treatment. Parallel pre-treatment trends provides evidence that treated and control firms would have evolved in parallel absent treatment. Systematic and monotonic differences between treated and control groups in the pre-treatment period implies differences in trends. Random differences in pre-treatment periods mitigate such concerns.

Our approach follows Fuest et al. (2018). We incorporate ten new binary variables into our main specifications. Five variables (lag variables) are coded to 1 if a tax rate increase (or decrease) is *j* years away while our lead variables are coded to 1 if a tax rate increase is *j* years in the past, where *j* ranges from 1 to 5. All other years are coded to 0. In other words, each variable captures

the effect of being *j* years away from a rate increase or decrease among treated firms. Our specifications do not include a treatment year dummy due to collinearity. Our specifications incorporate controls and fixed effects as before. We cluster standard errors as before. We plot the coefficients of the lead and lag variables in Figure 1. Coefficients on increase dummies are connected using a blue line while coefficients on decrease dummies are connected using an orange line.

Our results are reported in Figure 1. First, we plot the coefficient when *Sales* is our dependent variable. We find that the treatment and control sales are non-significantly different in the pre-treatment period when *Increase* is our dependent variable. Prior to treatment, *Sales* of firms facing tax rate increases do not appear to be trending differently than sales of control firms. Firms facing tax rate decreases differ substantially from control firms but do not exhibit a discernible trend. Next, we use *COGS* as our dependent variable. Firms facing a tax increase do not differ discernibly from control firms prior to treatment but exhibit lower *COGS* following treatment. Firms facing a tax rate decrease differ from control firms both positively and negatively prior to treatment, though no trend is discernible. Following treatment, tax rate decrease firms do not differ much from control firms. Next, we use *SG&A* as our dependent variable. Firms facing a tax increase seem to be increasing significantly relative to control firms in the three years prior to treatment. This biases against finding a decrease in SG&A, as we do in our main results. Firms facing tax rate decreases are trending downwards relative to control firms. Again, this biases against finding that rate decreases increase wages and SG&A. In Panel D, we plot non-state taxes. Firms facing a tax increase do not differ significantly from control firms in the pre-treatment period but exhibit lower non-state taxes following treatment. Firms facing tax rate decreases differ both negatively and positively from control firms prior to treatment. No trend is discernible. In Panel E, we plot net income. Firms facing rate increases do not differ much relative to control firms.

Firms facing rate decreases seem to exhibit relatively lower net income relative to control firms, though no trend is discernible. Across all results, we are unable to identify clear differences in pre-treatment trends that might bias in our favor.

6.3 Overlapping tax increases and decreases

In this section, we examine whether our results are sensitive to omitting firm-years in which firm *i* is treated by both state tax rate increases and decreases. In our main analyses, we incorporated separate *Increase* and *Decrease* variables. By doing so, we control for simultaneous tax rate changes and sharpen estimates in estimating the effects of tax rate increases and decreases. For robustness, we omit firm-years in which firm *i* has faced a tax rate increase and a tax rate decrease in prior years or the current year. In other words, we drop observations where both *Increase* and *Big Decrease* are coded to 1.[32]

Our results are reported in Table 7. We find that the coefficients on *Increase* are as expected. Specifically, the coefficients on *Increase* are negative and significant at conventional levels when *Sales, COGS, SG&A* and *Non-state taxes* are our dependent variables. The coefficient on *Net Income* is nonsignificant at conventional levels. These results are consistent with our main results. Similarly, the coefficients on *Decrease* are all nonsignificant except when *SG&A* is our dependent variable. These results are consistent with our prior results when *Big Decrease* is our variable of interest (Table 6).

6.4 Nexus in non-headquarter states

In this section, we analyze the effects of corporate income tax rate changes in any state in which the firm likely has nexus. In our main analyses, we examined changes in corporate income tax rate changes in firms' headquarter states because firms have nexus in headquarter states. However, we omit several states in which a firm may pay corporate income taxes by focusing only

[32] We use *Big Decrease* in these tests to demonstrate that our results on *Big Decrease* (Table 6) are not sensitive to omitting firm-years in which both *Increase* and *Big Decrease* are turned "on" or coded to 1.

on headquarter states. For comprehensiveness, we examine incidence in all states in which we expect firms to pay corporate income taxes and estimate state corporate income tax apportionment.

Both approaches result in error. If we attempt to identify states in which the firm has nexus, we may include states in which the firm actually has no nexus because nexus information is likely only available to the firm itself. If we only examine headquarter states, we omit other states in which the firm has nexus. Thus, we examine other states in which the firm likely has nexus for completeness and acknowledge that the approach is imperfect.

We rely on the (1) the number of employees of a given firm in a given state and (2) the number of establishments of a given firm in a given state to measure nexus. We focus on employees and establishments because both imply that the firm has a physical presence in the given state and should thus have state income tax nexus in that state. We use the YourEconomy Time Series (YTS) to measure employee counts of a given firm in a given state. This dataset covers publicly-traded firms and surveys establishments across all states to determine whether the establishment is associated with a publicly-traded firm while also verifying the number of employed persons at the establishment.

We construct a new variable as our independent variable of interest that is intended to roughly capture state corporate income tax apportionment.[33] This variable is the proportion of firm *i*'s (1) establishments or (2) employees in a given state compared to all other states. For example, if firm *i* employs 100 people nation-wide and 10 people in California, the measure would be 10/100 or .1. We then multiply this measure by *Increase* (and *Decrease*) to incorporate this apportionment measure into our generalized difference-in-differences framework. This approach is similar to the apportionment tests in Ljungqvist et al. (2016) and Heider and Ljungqvist (2014). Following those

[33] State corporate income tax apportionment formulas vary across states and across years. Thus, it is onerous and empirically difficult to use actual formulas to calculate apportionment. Moreover, we do not have the data to do so (e.g. payroll data).

two studies, we cluster standard errors by state in this test. Our specification is otherwise unchanged from our main analyses.

Our results are reported in Table 8. In Panel A, we weight our treatment variable by number of employees. In Panel B, we weight our treatment variable by the number of establishments. In Panel A, consistent with our main analyses, we find that the coefficient on *Increase* is negative and significant at conventional levels when *Sales*, *COGS, SG&A* or *Non-state taxes* is our dependent variable. Interestingly, we find that the coefficient on *Increase* is positive and significant when *Net Income* is our dependent variable. This result is consistent with overshifting: tax rate increases reduce expenses by more than they reduce sales, thus resulting in hgiher net income. In terms of welfare, shareholders *benefit* from tax increases because they are able to shift more than the increase in state taxes to various firm stakeholders. This result is consistent with an imperfect competition model and with Krzyzaniak and Musgrave (1963), who find that the corporate income tax is overshifted using time series analyses (Fullerton and Metcalf 2002 survey overshifting of corporate income taxes). The coefficients on *Decrease* are non-significant except when *Net Income* is our dependent variable. Again, this result is consistent with overshifting.

In Panel B, we weight our treatment variable by the number of establishments of a given firm in a given state. The coefficient on *Increase* is negative and significant at conventional levels when *Sales, COGS, SG&A and Net Income* are our dependent variables. The coefficient on *Increase* when *Net Income* is our dependent variable is positive and significant at the 10% level. The latter result is again consistent with overshifting. The coefficients on *Decrease* are non-significant at conventional levels except when *Net Income* is our dependent variable. Again, we find that the coefficient on *Decrease* is negative and significant at the 10% level when *Net Income* is our dependent variable, which is consistent with overshifting and imperfect competition theories of tax incidence.

6.5 Association between state taxes and future performance

Our main results use state tax rate changes as exogenous variation to identify incidence on firm stakeholders. As an additional robustness check to our main result, we test for an association between the level of state tax expense and our proxies for stakeholder welfare (sales, COGS, SG&A, non-state taxes, and net income). State tax expense varies with state-level tax policies (e.g., depreciation allowances) in addition to state tax rates. Thus, we use state tax expense in a pooled OLS framework for robustness. We estimate the following model using ordinary least squares:

$$StakeholderProxy_{it} = \beta_0 + \beta_1 StateTaxes_{i,t-1} + \beta_2 StakeholderProxy_{i,t-1} + \beta_3 StateTaxes_{i,t} + \sum \beta_k Controls_{it} + \varepsilon_{it} \quad (8)$$

StakeholderProxy refers to one of the proxy variables previously used to measure stakeholder welfare (*Sales, COGS, SG&A, Non-state Taxes,* and *Net Income*). We use $StakeholderProxy_t$ as our dependent variable and include the lagged $StakeholderProxy_{t-1}$ as a control variable. Our coefficient of interest in this scenario is β_1, representing the association between lagged state tax expense ($StateTaxes_{t-1}$) and current stakeholder welfare. We lag state tax expense relative to our stakeholder proxy variables as current state tax expense will have mechanical reverse causality with our income-statement based proxies for stakeholder welfare. For example, all else equal, additional revenue would generate additional state tax expense in the current period. Using lagged state taxes breaks this reverse causality and allows us to identify the effect of taxes on future firm outcomes. As there is autocorrelation in the state tax expense, we include current state tax expense in equation (8) as a control variable. Other control variables used in this specification are the same as those used for our main test – *ln(Assets)*, *Leverage*, *PP&E(Net)*, *Foreign Income*, *TA*, *GSP Growth*, and *Unemployment*. We also include firm, year and state fixed effects.

Results from estimating equation (8) are reported on Table 10. State taxes are negatively associated with future sales, COGS, and SG&A. This is consistent with our main results on Table

4 and is evidence that consumers, suppliers, and employees bear the incidence of corporate income taxation. Unlike our main results, this specification fails to find evidence of incidence on non-state governments but does find incidence on shareholders.

7. CONCLUSION

Using a staggered difference-in-differences design, we find evidence that the burden of corporate income tax increases is shared by a multitude of stakeholders in the firm. Specifically, we find that state corporate income tax rate increases are associated with reductions in equity financing and firm investment. We further find that tax rate increases are associated with reductions in revenues, COGS, SG&A, and non-state taxes, but we fail to find an association with tax rate increases and net income. We interpret these results as firms transferring the incidence of taxation to consumers, suppliers, employees, and non-state governments on behalf of shareholders. We perform cross-sectional tests to verify that the amount of tax incidence borne by each stakeholder varies among dimensions predicted to affect tax incidence for that stakeholder.

We also test whether the firm's stakeholders benefit from a corporate income tax rate decrease. We find that most tax rate reductions are too small to observe an effect. When we limit our analysis to only include tax rate reductions of 1% or more, we find that these larger reductions are associated with an increase in SG&A expense. We interpret this evidence as consistent with tax cuts benefitting the firm's employees. In robustness tests, we (1) exclude overlapping state tax rate increases and decreases, (2) use non-headquarter states to identify nexus and (3) replace state tax rate changes with state tax expense as our independent variable in pooled, OLS regressions. These tests are mostly consistent with our main results.

Our study makes two primary contributions. First, we find evidence that corporate income tax increases are associated with reductions in equity issuances and investment – as is assumed by various corporate income tax models in the literature (e.g., Auerbach 2006). Second, we

demonstrate that incidence itself is asymmetric. While we find evidence that a multitude of stakeholders bear the burden of a tax rate increase, we only find evidence that the firm's employees benefit from a tax rate decrease. Our study should prove useful to policymakers interested in raising corporate income tax rates and those interested in predicting the consequences of the Tax Cuts and Jobs Act of 2017.

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Appendix A: Variable Definitions

Dependent Variables	
Sales	Sales (net) (SALES) scaled by beginning total assets (AT)
COGS	Cost of goods sold (COGS) scaled by beginning total assets (AT)
SG&A	Sales, general and administrative expense (XSGA) scaled by beginning total assets (AT)
Non-state Taxes	Total income tax expense (TXT) minus state income tax expense (TXS) scaled by beginning total assets (AT)
Net Income	Net income (NI) scaled by beginning total assets (AT)
Equity Issuances	Sale of common stock and preferred stock (SSTK) scaled by beginning total assets (AT)
Net Equity Issuances	Sale of common stock and preferred stock (SSTK) minus purchase of common stock and preferred stock (PRSTKC) scaled by beginning total assets (AT)
Capex	Capital expenditures (CAPX) scaled by beginning total assets (AT)
R&D Expense	Research and development expense (XRD) in year t scaled by total assets in year t-1. We set missing values to zero
Independent Variables	
Increase	Takes a value of 1 if the given firm is headquartered in a state that experienced a state corporate income tax rate increase in the current year or a prior year in the sample
Decrease	Takes a value of 1 if the given firm is headquartered in a state that experienced a state corporate income tax decrease in the current year or a prior year in the sample
Controls	
ln(Assets)	The natural logarithm of assets (AT)
Book-to-Market	Natural log of book-to-market at fiscal year-end
Comdiv	Common stock dividends (DVC) scaled by beginning total assets (AT)
CETR3	3-year cumulative cash effective tax rate calculated as the 3-year sum of cash taxes paid (TXPD) scaled by the 3-year sum of pre-tax income (PI) less special items (SPI) and multiplied by -1
Foreign Income	Foreign pre-tax income (PIFO) scaled by beginning total assets (AT)
Earnings	Net income (NI) scaled by beginning total assets (AT)
Intangibles	Intangibles (INTAN) scaled by beginning total assets (AT)
Leverage	Long term debt (DLTT) scaled by beginning total assets (AT)
NOL	Equals 1 if the firm reports a positive NOL carryforward (TLCF) and 0 itherwise
PPE(Net)	Net property, plant and equipment (PPENT) scaled by beginning total assets (AT)

TA	Total accruals, Income before extraordinary items (IB) minus cash flows from operating activities (OANCF) scaled by beginning total assets (AT)
GSP Growth	Economic growth rate for each state extracted from the FRED Economic Data website
Unemployment	Unemployment rate for each state extracted from the FRED Economic Data website
Cross-sectional variables	
Elasticity	Coded to 1 if firm *i*'s Fama French 12 is 1, 2, 3, 4, 5, 6, or 7 and 0 if firm *i*'s Fama French 12 is 9, 10, and 12
IndAdjPM	Industry adjusted profit margin is defined as a firm's profit margin minus the mean profit margin by industry (SIC2) in a given fiscal year. Profit margin is calculated as pretax income (PI – SPI) divided by sales (SALE)
UnionMembership	An indicator that take a value of 1 if a firm faces union membership above the median union membership by industry (SIC2) in a given calendar year. Union membership is defined as percentage of nonagricultural wage and salary employees who are union members in a state in a given year. we obtain the data from http://www.unionstat.com.
TaxRisk	Standard deviation of GAAP effective tax rates (TXT/(PI-SPI)) over the past five years (t-4 to t)
FinConst	We calculate *Altman-Z Score* as follows: $Altman\text{-}Z = \{3.3*PI + 1*SALE + 1.4*RE + 1.2*(ACT - LCT)\}/lagAT$ Where *PI* is pre-tax income, *SALE* is sales, *RE* is retained earnings, *ACT* is current assets, *LCT* is current liabilities, and *lagAT* is lagged total assets (AT)

Figure 1: Event study and parallel trends for tax rate decreases

Note: These figures provide graphical results of event studies of the effects of tax rate increases (blue lines) and tax rate decreases (orange lines) on sales, COGS, SG&A, non-state taxes and net income.

Table 1. Descriptive Statistics

VARIABLES	N	Mean	Median	SD	Min	25th	75th	Max
Sales t	93792	1.382	1.173	1.042	0.000	0.686	1.781	5.816
COGS t	93792	0.909	0.694	0.855	0.000	0.324	1.195	4.771
SG&A t	93792	0.408	0.309	0.385	0.016	0.155	0.531	2.388
Non-state Taxes t	93792	0.019	0.010	0.038	-0.099	0.000	0.036	0.164
Net Income t	93792	-0.038	0.030	0.295	-1.781	-0.058	0.086	0.482
Increase	93792	0.309	0.000	0.462	0.000	0.000	1.000	1.000
Decrease	93792	0.425	0.000	0.494	0.000	0.000	1.000	1.000
Net Equity Issue t	92181	0.121	0.004	0.435	0.000	0.000	0.024	3.220
Equity Issuances t	93640	0.105	0.001	0.428	-0.184	0.000	0.016	3.138
Capex t	93004	0.073	0.041	0.099	0.000	0.019	0.085	0.628
R&D t	93792	0.051	0.000	0.102	0.000	0.000	0.060	0.603
Controls:								
ln(Assets) t-1	93792	4.802	4.749	2.238	-0.272	3.207	6.353	10.191
Leverage t-1	93792	0.196	0.110	0.254	0.000	0.001	0.297	1.416
PPE(Net) t-1	93792	0.325	0.231	0.313	0.001	0.102	0.442	1.739
ForeignIncome t-1	93792	0.008	0.000	0.027	-0.065	0.000	0.000	0.147
TA t	93792	-0.070	-0.056	0.162	-0.858	-0.116	-0.005	0.441
GSP Growth t	93792	0.026	0.026	0.027	-0.103	0.011	0.043	0.222
Unemployment t	93792	0.060	0.057	0.019	0.022	0.047	0.069	0.139
Book-to-Market t	89397	0.721	0.511	0.738	0.025	0.283	0.881	4.692
Comdiv t	93792	0.008	0.000	0.020	0.000	0.000	0.004	0.132
CETR3 t	53167	0.276	0.278	0.168	0.000	0.159	0.368	1.000
Intangibles t	84292	0.154	0.046	0.248	0.000	0.000	0.210	1.462
NOL t	93792	0.370	0.000	1.220	0.000	0.000	0.097	8.629

Note: Our sample period spans 1989 to 2012. All variables are winsorized at the 1st and 99th percentiles to mitigate the effect of outliers. Variable definitions are provided in Appendix A.

Table 2. The effect of state tax changes on firms' equity issuance decisions

	Predicted	(1) *Net Equity Issuances*	(2) *Equity Issuances*
Increase	-	-0.021***	-0.013***
		(-4.07)	(-2.71)
Decrease	+	-0.001	-0.000
		(-0.33)	(-0.13)
ln(Assets)	+	0.005*	0.006**
		(1.46)	(2.05)
Book-to-Market t	-	-0.012***	-0.014***
		(-3.44)	(-4.45)
Comdiv t	+	0.316***	0.297***
		(11.55)	(10.93)
SG&A t	+	0.468***	0.501***
		(2.65)	(2.76)
Earnings t	-/+	0.104***	0.162***
		(4.39)	(6.94)
CETR3 t	+	-0.011*	-0.005
		(-1.36)	(-0.61)
Leverage t	-	-0.085***	-0.078***
		(-4.29)	(-3.77)
Intangibles t	+	0.154***	0.133***
		(8.01)	(6.47)
PPE(Net) t	+	0.156***	0.143***
		(8.28)	(7.35)
Foreign Income t	-	-0.257***	-0.155***
		(-5.56)	(-3.17)
NOL t	+	-0.003	-0.005
		(-0.27)	(-0.57)
GSP Growth t	+	0.119***	0.064***
		(4.12)	(2.83)
Unemployment t	-/+	-0.009	0.041
		(-0.09)	(0.45)
Observations		44,591	44,591
Adj. R2		0.361	0.357
Year FE		Yes	Yes
Firm FE		Yes	Yes
State FE		Yes	Yes

Notes: This table presents the results of a difference-in-difference regression using state tax rate changes as plausibly exogenous treatment events. In column (1), we use share issuances minus share repurchases scaled by lagged assets as our dependent variable. In column (2), we use share issuances scaled by lagged assets as our dependent variable. Our control variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the firm and year level, following the suggestions in Petersen (2009).We perform one-sided t-tests on each coefficient. t-statistics are in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 3. The effect of state tax changes on firms' investment

	Predicted	(1) *Capex*	(2) *R&D expense*
Increase	-	-0.003**	-0.006***
		(-1.85)	(-3.49)
Decrease	+	0.001	-0.001
		(0.80)	(-0.86)
ln(Assets)	+	-0.003***	-0.000
		(-2.69)	(-0.20)
Book-to-Market t	-	-0.009***	-0.000
		(-6.34)	(-0.22)
Comdiv t	+	0.024***	0.078***
		(5.94)	(17.84)
SG&A t	+	-0.076***	-0.003
		(-3.56)	(-0.33)
Earnings t	-/+	0.064***	-0.009**
		(12.43)	(-2.19)
CETR3 t	+	0.000	-0.002*
		(0.15)	(-1.62)
Leverage t	-	-0.014***	-0.003**
		(-3.74)	(-1.74)
Intangibles t	+	-0.007**	0.001
		(-2.11)	(0.22)
PPE(Net) t	+	0.296***	0.003*
		(33.42)	(1.51)
Foreign Income t	-	-0.030***	0.010
		(-2.88)	(0.96)
NOL t	+	-0.012***	0.002
		(-3.90)	(0.76)
GSP Growth t	+	0.025*	-0.003
		(1.52)	(-0.56)
Unemployment t	-/+	-0.140***	-0.009
		(-3.21)	(-0.48)
Observations		44,591	44,591
Adj. R2		0.753	0.887
Year FE		Yes	Yes
Firm FE		Yes	Yes
State FE		Yes	Yes

Notes: This table presents the results of a difference-in-difference regression using state tax rate changes as plausibly exogenous treatment events. In column (1), we use capital expenditure as a proxy for firms' investment. In column (2), we use R&D expense as a proxy for firms' investment. Our control variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the firm and year level, following the suggestions in Petersen (2009).We perform one-sided t-tests on each coefficient. t-statistics are in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 4. State tax rate increases and decreases

	(1)	(2)	(3)	(4)	(5)
	Sales	*COGS*	*SG&A*	*Non-state Taxes*	*Net Income*
Increase	-0.060***	-0.028**	-0.029***	-0.004***	0.008
	(-2.85)	(-1.80)	(-2.99)	(-2.95)	(1.04)
Decrease	-0.015	-0.009	0.003	-0.001	-0.003
	(-0.99)	(-0.84)	(0.49)	(-0.68)	(-0.92)
ln(Assets) t-1	-0.353***	-0.210***	-0.187***	-0.004***	0.034***
	(-17.06)	(-16.65)	(-16.91)	(-6.48)	(7.50)
Leverage t-1	-0.050**	-0.039**	0.041***	-0.012***	-0.045***
	(-2.23)	(-2.49)	(4.55)	(-12.80)	(-5.45)
PPE(Net) t-1	0.012	-0.034**	-0.001	0.007***	0.001
	(0.55)	(-2.09)	(-0.08)	(6.47)	(0.06)
Foreign Income t-1	1.340***	0.619***	0.386***	0.096***	0.258***
	(9.57)	(5.85)	(7.06)	(8.55)	(7.41)
TA t	0.332***	0.130***	-0.236***	0.015***	0.789***
	(7.12)	(3.96)	(-6.68)	(3.86)	(24.36)
GSP Growth t	0.082	0.071	-0.089*	0.010	0.023
	(0.51)	(0.56)	(-1.70)	(0.92)	(0.60)
Unemployment t	-1.434***	-1.171***	-0.502***	-0.069***	0.036
	(-2.88)	(-3.06)	(-2.91)	(-2.96)	(0.25)
Observations	93,792	93,792	93,792	93,792	93,792
Adjusted R-squared	0.736	0.781	0.754	0.324	0.680
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes

Notes: This table presents baseline firm-level difference-in-difference estimates using state tax rate changes as treatment. We use five dependent variables from firms' income statements to measure incidence on various stakeholders. *Sales* is constructed as sales divided by lagged assets. *COGS* is constructed as the cost of goods sold divided by lagged assets. *SG&A* is constructed as sales, general and administrative expenses divided by lagged assets. *Non-state Taxes* is total tax expense minus federal tax expense scaled by lagged assets. *Net Income* is net income scaled by lagged assets. In each specification, we use various state-level controls measured at *t* and firm-level controls measured at *t-1*. All control variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the firm and year level, following the suggestions in Petersen (2009). One-sided t-tests are performed on our *Increase and Decrease* variables, except when *Sales* is the dependent variable. t-statistics are in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 5. Cross-sectional tests

Dependent Variable	(1) *Sales*	(2) *COGS*	(3) *SG&A*	(4) *Non-state Taxes*	(5) *Net Income*
Increase	0.003	-0.022*	-0.020**	-0.002*	0.022***
	(0.09)	(-1.47)	(-2.19)	(-1.60)	(2.69)
*Increase*XsecVar*	-0.097**	-0.001***	-0.015**	-0.010*	-0.031***
	(-2.38)	(-3.35)	(-1.88)	(-1.36)	(-4.72)
Decrease	-0.045**	-0.012	-0.002	-0.002**	-0.005
	(-1.84)	(-1.12)	(-0.30)	(-1.80)	(-1.13)
Decrease XsecVar*	0.050*	0.000**	0.007	0.017***	0.011**
	(1.63)	(1.74)	(0.96)	(2.76)	(1.88)
XsecVar	-0.055	0.001***	0.009*	-0.013**	0.116***
	(-1.17)	(4.30)	(1.60)	(-1.99)	(36.72)
ln(Assets) t-1	-0.353***	-0.239***	-0.187***	-0.009***	0.044***
	(-17.11)	(-18.41)	(-16.90)	(-9.69)	(8.83)
Leverage t-1	-0.050**	-0.034**	0.041***	-0.017***	-0.024***
	(-2.23)	(-2.11)	(4.57)	(-12.57)	(-2.89)
PPE(Net) t-1	0.012	-0.053***	-0.002	0.014***	-0.010
	(0.52)	(-3.09)	(-0.10)	(10.01)	(-0.66)
Foreign Income t-1	1.337***	0.659***	0.385***	0.094***	0.135***
	(9.60)	(6.36)	(7.05)	(7.54)	(3.76)
TA t	0.332***	0.148***	-0.236***	0.043***	0.762***
	(7.08)	(4.63)	(-6.68)	(10.53)	(22.85)
GSP Growth t	0.073	0.078	-0.092**	0.013	0.017
	(0.45)	(0.59)	(-1.75)	(1.06)	(0.49)
Unemployment t	-1.421***	-1.194***	-0.475***	-0.094***	0.146
	(-2.86)	(-3.03)	(-2.75)	(-3.69)	(1.06)
Observations	93,443	91,600	93,792	69,597	90,526
Adjusted R-squared	0.735	0.789	0.754	0.360	0.696
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes

Notes: This table presents cross-sectional tests using a different cross-sectional variable for each dependent variable. *XsecVar* represents the different cross-sectional variables. First, we use elasticity in the *Sales* test. Second, we use industry-adjusted profit margins in the *COGS* test. Third, we use union membership in the *SG&A* test. Fourth, we use volatility of GAAP effective tax rates over the past five years in the *Non-state Taxes* test. We use Altman-Z scores in the *Net Income* test. All variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the firm and year level, following the suggestions in Petersen (2009). One-sided t-tests are performed on our interaction terms, *Increase* and *Decrease*, except when *Sales* is the dependent variable. t-statistics are in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 6. Additional test: State tax rate increases and big decreases

Dependent Variable	(1) *Sales*	(2) *COGS*	(3) *SG&A*	(4) *Non-state Taxes*	(5) *Net Income*
Increase	-0.062***	-0.029**	-0.028***	-0.004***	0.007
	(-2.90)	(-1.88)	(-2.93)	(-3.00)	(0.99)
Big Decrease	0.002	-0.008	0.020**	-0.001	0.001
	(0.08)	(-0.40)	(1.99)	(-0.91)	(0.13)
ln(Assets) t-1	-0.353***	-0.210***	-0.187***	-0.004***	0.034***
	(-17.11)	(-16.68)	(-16.95)	(-6.42)	(7.48)
Leverage t-1	-0.050**	-0.039**	0.041***	-0.012***	-0.045***
	(-2.23)	(-2.49)	(4.55)	(-12.79)	(-5.45)
PPE(Net) t-1	0.012	-0.034**	-0.001	0.007***	0.001
	(0.55)	(-2.09)	(-0.07)	(6.45)	(0.06)
Foreign Income t-1	1.339***	0.618***	0.385***	0.096***	0.258***
	(9.58)	(5.85)	(7.03)	(8.55)	(7.41)
TA t	0.332***	0.130***	-0.236***	0.015***	0.789***
	(7.12)	(3.96)	(-6.68)	(3.86)	(24.36)
GSP Growth t	0.065	0.060	-0.086*	0.010	0.020
	(0.40)	(0.48)	(-1.65)	(0.89)	(0.50)
Unemployment t	-1.326**	-1.134***	-0.455***	-0.070***	0.060
	(-2.72)	(-3.02)	(-2.66)	(-3.14)	(0.44)
Observations	93,792	93,792	93,792	93,792	93,792
Adjusted R-squared	0.736	0.781	0.754	0.324	0.680
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes

Notes: This table presents firm-level difference-in-difference estimates using state tax rate changes as plausibly exogenous treatment events. We limit tax rate decreases to only those that reduced tax rates by 1% or more. We use five dependent variables from firms' income statements to measure incidence on various stakeholders. In each specification, we use various state-level measured at *t* and firm-level controls measured at *t-1*. All variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the firm and year level, following the suggestions in Petersen (2009). One-sided t-tests are performed on our *Increase and Decrease* variables, except when *Sales* is the dependent variable. t-statistics are in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 7. Robust test: Omitting firms with overlapping tax rate increases and decreases

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	*Sales*	*COGS*	*SG&A*	*Non-state Taxes*	*Net Income*
Increase	-0.064**	-0.028*	-0.026***	-0.004***	0.006
	(-2.73)	(-1.67)	(-2.50)	(-3.05)	(0.72)
Big Decrease	0.044	0.017	0.059***	-0.004	-0.011
	(1.00)	(0.52)	(4.85)	(-1.24)	(-1.07)
ln(Assets) t-1	-0.355***	-0.212***	-0.188***	-0.004***	0.034***
	(-17.14)	(-16.65)	(-17.17)	(-6.83)	(7.64)
Leverage t-1	-0.000***	-0.000	0.000	-0.000***	-0.000**
	(-2.96)	(-0.15)	(1.25)	(-3.18)	(-2.21)
PPE(Net) t-1	-0.014	-0.054***	0.015	0.002*	-0.016
	(-0.69)	(-3.31)	(0.89)	(1.63)	(-1.18)
Foreign Income t-1	1.393***	0.666***	0.383***	0.096***	0.271***
	(9.40)	(5.95)	(6.86)	(8.37)	(7.55)
TA t	0.318***	0.122***	-0.248***	0.014***	0.796***
	(6.80)	(3.72)	(-6.93)	(3.76)	(23.93)
GSP Growth t	0.070	0.058	-0.103**	0.013	0.036
	(0.39)	(0.43)	(-1.72)	(1.22)	(0.84)
Unemployment t	-1.391***	-1.152***	-0.438**	-0.086***	0.029
	(-2.84)	(-3.06)	(-2.39)	(-3.99)	(0.21)
Observations	87,104	87,104	87,104	87,104	87,104
Adjusted R-squared	0.733	0.778	0.751	0.316	0.681
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes

Notes: This table presents baseline firm-level difference-in-difference estimates using state tax rate increases as plausibly exogenous treatments after omitting observations in which *Increase* and *Decrease* both equal 1 We use five dependent variables from firms' income statements to measure incidence on various stakeholders In each specification, we use various state-level controls measured at *t* and firm-level controls measured at *t-1*. All variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the firm and year level, following the suggestions in Petersen (2009). One-sided t-tests are performed on our *Increase and Decrease* variables, except when *Sales* is the dependent variable. t-statistics are in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 8. Robust test: Establishment-level nexus

Panel A. Nexus based on number of employees					
	(1)	(2)	(3)	(4)	(5)
Dependent Variable	*Sales*	*COGS*	*SG&A*	*Non-state Taxes*	*Net Income*
Increase	-0.053***	-0.025**	-0.037***	-0.003**	0.021**
	(-2.41)	(-1.72)	(-2.71)	(-1.78)	(1.91)
Decrease	-0.010	-0.011	0.018	-0.000	-0.013*
	(-0.27)	(-0.42)	(0.84)	(-0.09)	(-1.60)
ln(Assets) t-1	-0.372***	-0.217***	-0.181***	-0.003***	0.021***
	(-20.68)	(-14.26)	(-10.64)	(-5.49)	(3.63)
Leverage t-1	-0.079**	-0.054**	0.032*	-0.016***	-0.049***
	(-1.77)	(-1.91)	(1.67)	(-6.89)	(-4.73)
PPE(Net) t-1	0.065*	-0.023	0.026**	0.009***	0.011
	(1.32)	(-0.75)	(2.07)	(2.72)	(0.98)
Foreign Income t-1	1.003***	0.443***	0.191***	0.081***	0.301***
	(6.74)	(5.39)	(2.86)	(5.24)	(6.94)
TA t	0.348***	0.139***	-0.286***	0.005	0.856***
	(7.19)	(3.75)	(-9.86)	(1.14)	(28.68)
GSP Growth t	0.182	-0.013	0.057	0.006	0.038
	(0.87)	(-0.10)	(0.54)	(0.35)	(0.83)
Unemployment t	-0.581	-0.514	-0.527**	-0.057**	0.033
	(-0.94)	(-1.29)	(-2.10)	(-2.05)	(0.21)
Observations	27,953	27,953	27,953	27,953	27,953
Adjusted R-squared	0.802	0.842	0.807	0.372	0.731
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Panel B. Nexus based on number of establishments					
	(1)	(2)	(3)	(4)	(5)
Dependent Variable	*Sales*	*COGS*	*SG&A*	*Non-state Taxes*	*Net Income*
Increase	-0.051**	-0.027*	-0.039***	-0.001	0.028*
	(-1.85)	(-1.35)	(-2.94)	(-0.61)	(1.58)
Decrease	0.005	0.002	0.020	0.001	-0.012*
	(0.11)	(0.05)	(0.87)	(0.67)	(-1.52)
ln(Assets) t-1	-0.372***	-0.217***	-0.181***	-0.003***	0.021***
	(-20.73)	(-14.35)	(-10.58)	(-5.48)	(3.62)
Leverage t-1	-0.079**	-0.054**	0.032*	-0.016***	-0.049***
	(-1.78)	(-1.91)	(1.67)	(-6.85)	(-4.69)
PPE(Net) t-1	0.065*	-0.023	0.026**	0.009***	0.012
	(1.33)	(-0.75)	(2.07)	(2.76)	(1.01)
Foreign Income t-1	1.002***	0.442***	0.190***	0.081***	0.301***
	(6.74)	(5.40)	(2.87)	(5.22)	(6.97)

TA t	0.348***	0.139***	-0.286***	0.005	0.856***
	(7.17)	(3.76)	(-9.81)	(1.16)	(28.63)
GSP Growth t	0.181	-0.015	0.059	0.007	0.037
	(0.87)	(-0.11)	(0.56)	(0.37)	(0.81)
Unemployment t	-0.554	-0.479	-0.544**	-0.056**	0.046
	(-0.91)	(-1.22)	(-2.06)	(-1.92)	(0.28)
Observations	27,953	27,953	27,953	27,953	27,953
Adjusted R-squared	0.802	0.842	0.807	0.372	0.731
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes

Notes: This table presents firm-level difference-in-difference estimates using state tax rate increases as plausibly exogenous treatments. *Increase* and *Decrease* are weighted by firm *i*'s estimated apportionment to the first state in which it likely has nexus that changes tax rates. We use five dependent variables from firms' income statements to measure incidence on various stakeholders. In each specification, we use various state-level controls measured at *t* and firm-level controls measured at *t-1*. All variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the state level. One-sided t-tests are performed on our *Increase* and *Decrease* variables, except when *Sales* is the dependent variable. t-statistics are in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 9: Robustness test: Association between state taxes and future performance

Dependent Variable	(1) *Sales t*	(2) *COGS t*	(3) *SG&A t*	(4) *Non-state Taxes t*	(5) *Net Income t*
State Taxes t-1	-14.020***	-7.819***	-2.062***	0.053	-1.443***
	(-18.15)	(-11.74)	(-7.83)	(0.72)	(-5.84)
Sales t-1	0.349***				
	(19.47)				
COGS t-1		0.345***			
		(19.49)			
SG&A t-1			0.186***		
			(11.52)		
Non-state Taxes t-1				0.124***	
				(8.26)	
Net Income t-1					0.123***
					(8.99)
State Taxes t	35.098***	18.922***	5.566***	3.206***	8.578***
	(29.68)	(21.46)	(13.48)	(39.92)	(29.84)
ln(Assets) t-1	-0.216***	-0.151***	-0.142***	-0.001***	0.049***
	(-14.58)	(-14.22)	(-15.41)	(-3.15)	(12.49)
Leverage t-1	-0.192***	-0.146***	-0.011	-0.005***	-0.018**
	(-8.92)	(-8.23)	(-1.21)	(-7.54)	(-2.60)
PPE(Net) t-1	-0.366***	-0.311***	-0.104***	0.001	0.041***
	(-12.88)	(-13.55)	(-8.54)	(0.86)	(3.86)
Foreign Income t-1	0.291**	0.188**	0.275***	0.064***	0.068*
	(2.22)	(2.10)	(4.75)	(9.26)	(1.99)
TA t	0.092**	-0.078**	-0.257***	0.004	0.865***
	(2.77)	(-2.35)	(-8.50)	(1.50)	(24.55)
GSP Growth t	0.064	0.058	-0.101**	0.018*	0.035
	(0.45)	(0.53)	(-2.24)	(1.72)	(0.86)
Unemployment t	-0.585	-0.627**	-0.258*	-0.034	0.101
	(-1.68)	(-2.38)	(-1.87)	(-1.69)	(0.84)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Observations	82,318	82,318	73,513	82,318	82,313
R-squared	0.844	0.850	0.791	0.596	0.758

Notes: This table presents OLS estimates of the effect of state taxes on various income statement line items. We use state tax expense as our independent variable of interest and five variables from income statements as our dependent vairables. We incorporate state-specific controls measured in year *t* and firm-specic controls measured in year *t-1*. All variables are defined in Appendix A. Standard errors are robust to heteroscedasticity and clustered at the firm and year levels, following the suggestions in Petersen (2009). One-sided t-tests are performed except when *Sales* is our dependent variable. t-statistics are in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.