The Unintended Effect of Tax Avoidance Crackdown on Corporate Innovation

Abstract: To constrain the use of intangible assets in tax-motivated income shifting and thus crackdown on corporate tax avoidance, many U.S. state governments adopted addback statutes. Addback statutes require firms to add back intangible-related expenses paid to related parties in other states to the taxable income reported in the state taxable income. The addback reduces the benefits that firms and managers can gain from creating intangible assets such as patents. In this study, we examine the potential unintended effect of addback statutes on corporate innovation. First, we find that the adoption of addback statutes significantly reduces a firm's innovation, measured by the number of patents or patent citations. Second, the "disappeared patents" resulting from tax avoidance crackdown do not seem to be of lower quality than other patents. Third, after a state adopts an addback statute, a firm with material subsidiaries in that state assigns fewer patents to subsidiaries in Delaware, where income generated by intangible assets is free of state income tax. Finally, affected firms do not have lower innovation prior to the adoption of addback statues. Overall, these findings suggest that the adoption of addback statutes impedes corporate innovation. Our study has important implications for policy makers who are interested in understanding the consequences of policies that constrain tax-motivated income shifting using intangibles and prevent income base erosion.

Key words: Addback Statues, Innovation, Tax Avoidance Crackdown, Tax-Motivated Income Shifting.

1. Introduction

The past three decades have witnessed significant increases in corporate tax avoidance at both the state and federal levels (e.g., Institute on Taxation and Economic Policy 2017; Dyreng et al., 2017).[1] As one of the most important tax avoidance strategies, U.S. firms extensively use intangible assets to shift taxable income from high-tax areas to low-tax areas (Grubert and Slemrod, 1998; Bartelsman and Beetsma, 2003), reducing income taxes. For example, royalty income from patents are tax-free in Delaware. Dyreng, Lindsey, and Thornock (2013) show that U.S. firms avoid paying state-level income taxes by using patents to shift income from other states to Delaware. To combat such aggressive tax avoidance behavior, more than 20 state governments have adopted addback statutes that specifically target tax-motivated income shifting transactions using intangibles (e.g., Borens and Kerner, 2013). In particular, addback statutes require firms to add back intangible-related expenses paid to related parties in other states to the taxable income reported in the state tax return. Thus, these provisions are expected to effectively limit firms' ability to avoid paying state income taxes by using intangible assets to shift income. The adoption decisions by different state governments were made at different time points, providing a powerful setting to examine the economic consequence of this tax avoidance crackdown measure.

In this study, we examine a possible unintentional consequence of such corporate tax avoidance crackdown. Specifically, we examine whether the adoption of such addback statutes by U.S. state governments impedes corporate innovation. As discussed above, intangible assets play an essential role in corporate tax avoidance. Crackdown of tax-motivated income-shifting transactions using intangibles reduces the projected net present value (NPV) of research and development (R&D) projects. Thus, firms may be discouraged from engaging in innovation

[1] Tax avoidance refers to all the planning activities that reduce a firm's explicit taxes (Hanlon and Heitzman, 2010).

activities. Further, agency theory of tax avoidance (e.g., Desai, 2005; Desai and Dharmapala, 2006) suggests that managers extract private benefits from sophisticated tax avoidance transactions,. Addback statutes prevent firms from using intangible assets to avoid taxes and consequently could reduce the private benefits that managers can gain from creating intangible assets such as patents. This would reduce managers' personal interest in innovation and creating patents.

Our empirical tests employ a sample of U.S. firms from 1999 to 2006.[2] Following Dyreng, Lindsey, and Thornock (2013), we identify locations where a firm has economic nexus based on domestic material subsidiaries disclosed in Exhibit 21 of 10-K. We first test the effect of addback statutes on corporate tax avoidance. We find that the adoption of an addback statute in a state significantly increases the state effective tax rates of a firm with material subsidiaries in that state by 0.35 to 0.51 percent. This finding is robust to controlling for common determinants of corporate tax avoidance and supports the argument that addback statutes mitigate tax avoidance.

To measure a firm's innovation, we first rely on the count of utility patents (e.g, Griliches, Hall, and Pakes, 1987).[3] We find that the adoption of addback statutes significantly reduces a firm's innovation. Specifically, after the adoption of an addback statute in a state, we observe a 1.24 to 1.34 reduction in the number of patents filed by a firm with material subsidiaries in that state during the subsequent three or five years. These findings are robust to controlling for possibly correlated firm characteristics including R&D expenditures, capital intensity, and weighted average statutory state tax rates as well as industry, year and state fixed effects. On average, a firm

[2] We obtain patent data from Kogan et al. (2017). Our sample ends in 2006 because at least three years of subsequent patent data are required in the tests and the matched patent data from Kogan et al. (2017) are not available after 2009.
[3] There are three types of patents: utility patent, design patent, and plant patent. Utility patents, known as "patents for invention" are "patents issued for the invention of a new and useful process, machine, manufacture, or composition of matter, or a new and useful improvement" (see https://www.law.cornell.edu/wex/patent). In 2015, USPTO reported that about 90% of all patents granted are utility patents (see https://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports.htm).

files 17.38 to 24.39 patents during a three to five-year period. Therefore, the unintentional negative effect of addback statutes on innovation is both statistically and economically significant.

Prior studies (e.g, Hall, Jaffe, and Trajtenberg, 2005) suggest that the number of citations reflects the quality of a patent. If total citation count does not change, the decrease in the number of patents does not necessarily mean a drop in a firm's innovation. Therefore, we further examine whether the adoption of addback statutes also reduces the number of total citations that a firm receives on the patents filed subsequent to the adoption. We find that after the adoption of an addback statute in a state, a firm with material subsidiaries in that state has an approximately 1.37 to 1.47 reduction in the number of citations received on patents filed during the subsequent three or five years. On average, a firm receives 20.68 to 24.24 citations during a three to five year period. The decline in patent citations further indicates a significant unintentional negative effect of addback statutes on innovation.

The decline in patents and citations may not necessarily indicate a negative consequence if the "disappeared patents" are of low quality and little economic importance. To shield light on the quality of the disappeared patents, we examine whether addback statues affect the average number of citations per patent. However, we do not find average citations per patent changes significantly after the adoption of addback statutes. We also split the patents into two types based on whether a patent has any citation. We find that addback statues reduce not only zero-citation patents but also patents with citations. Taken together, these findings suggest that the disappeared patents resulting from tax avoidance crackdown do not seem to be of lower quality than other patents.

Next, we analyze the effect of addback statutes on the location of patents inside a firm. As discussed above, income generated from patents is tax-free in Delaware. Thus, firms would locate their patents in Delaware to facilitate tax-motivated income shifting. Specifically, we identify the

location of patent assignee from the United States Patent and Trademark Office (USPTO) patent assignment data. Consistent with prior studies (e.g., Dyreng, Lindsey, and Thornock, 2013), we observe that a disproportionately high portion of all the patents owned by firms in our sample are held in Delaware as royalty income from patents is tax-free in Delaware. We find that after a state adopts addback statutes, a firm with material subsidiaries in that state assigns fewer patents to Delaware. These findings are consistent with the argument that the adoption of addback statutes limits the use of patents in tax-motivated income shifting.

Further, we examine whether affected firms have lower innovation prior to the adoption of addback statues. We do not find significant difference in innovation in the two years before firms are affected by addback statues. This finding mitigates concerns that firms with higher innovation "self-select" to operate in states with lower probabilities to adopt addback statues, and that state governments make non-random adoption decisions.

Finally, we provide several other additional tests. For example, in a subsample of non-financially constrained firms, we still find significantly negative effects of addback statues on innovation, measured by both patent count and citation count. This finding mitigates concerns about an alternative explanation that the unintended effect on innovation is simply due to tax avoidance crackdown increasing firms' financial constraints and thus reducing R&D investment. In addition, we use a firm's R&D expenditures as an alternative measure of innovation. Our findings remain.

Our study makes several significant contributions to the accounting, tax, and economics literature. First, we contribute to the broad literature on the economic consequences of tax policies (e.g., Graham and Tucker, 2006; Blouin, Core, and Guay, 2010; Asker, Farre-Mensa, and Ljungqvist, 2015; Heider and Ljungqvist, 2015; Faulkender and Smith, 2016; Shevlin, Thornock,

and Williams, 2017), and more specifically the literature on the effect of tax policies on corporate innovation. Prior studies in this line of literature focus on the impact of R&D tax credits and changes in statutory tax rates that explicitly aim to encourage firms to take risk and invest in R&D projects. Both U.S. and international evidence suggests that firms respond to R&D tax credits and changes in statutory tax rates by changing their R&D investment (Hall, 1993; Hines, 1994; Hines and Jaffe, 2000; Bloom, Griffith, and Van Reenen, 2002). Differently, we examine state governments' adoptions of addback statutes, a type of tax policy that aims to crack down on tax avoidance but do not directly target corporate innovation. We find that such tax policies have a significant unintended negative effect on corporate innovation. The Tax Cuts and Jobs Act of 2017 also includes anti-base-erosion provisions similar to addback statutes, which aim to constrain tax-motivated income shifting by U.S. multinational firms to foreign countries with low taxes. Specifically, a U.S. firm's global intangible low-taxed income (GILTI) becomes taxable in the U.S. beginning after December 31, 2017. GILTI is calculated as the excess (if any) of the shareholder's global income over 10% of the qualified tangible assets minus certain expenses. Thus, the Tax Cuts and Jobs Act reduces US firms' ability to avoid US taxes by using intangible assets. Therefore, our study has important implications for policy makers in understanding the net benefits of such tax avoidance crackdown.

Second, our study contributes to the growing literature on the consequences of tax avoidance (Hansan et al., 2014; Goh et al., 2016; Chow, Klassen, and Liu, 2016; Baloria and Klassen, 2017; Bird, Edwards, and Shevlin, 2017). Prior studies focus on the effects of tax avoidance on the cost of external financing and the valuation of merger and acquisition deals. Our findings suggest that the crackdown on tax avoidance reduces a firm's innovation behavior. Put differently, corporate tax avoidance has a positive effect on innovation. Thus, our study helps understand the effect of

tax avoidance on firms' real activities. Third, our study also contributes to the literature on the determinants of corporate innovation (e.g., Hsu and Lim, 2013; Seru, 2014; Cornaggia et al., 2015). Our findings support the argument that the location of subsidiaries inside the U.S. affects corporate innovation.

We organize the remainder of the paper as follows. Section 2 provides relevant literature and develops our hypothesis. Section 3 describes the sample, data and variables. We present the regression models and main results in Section 4, and Section 5 provides the additional tests. Section 6 concludes.

2. Literature Review

2.1 Intangible Assets and Tax Avoidance

The rapid increase in corporate tax avoidance by U.S. firms over the last three decades has attracted significant attention from researchers, politicians and the public. For example, Dyreng et al. (2017) report that U.S. firms reduced their cash effective tax rates by approximately 10 percent from 1988 to 2012.[4] Avoidance of state corporate income taxes is also significant. The Institute on Taxation and Economic Policy (2017) shows that the average state effective tax rate is only 2.9 percent for 258 profitable Fortune 500 corporations in 2015, which is considerably lower than the statutory state corporate tax rate—about 6.25 percent.[5] Also, 92 out of the 258 profitable Fortune 500 corporations paid no state income tax in at least one year from 2008 to

[4] There are also alternative explanation for the decline in state tax rates. For example, Edwards, Kubata, and Shevlin (2018) argue that a large part of the decline in Cash ETRs documented in Dyreng et al. (2017) is not due to tax avoidance but rather growth in pre-tax income.

[5] In addition, a 7-percent average state effective tax rate was reported in a 1980 study by the Federal Reserve Board of San Francisco.

2015.[6] Further, the ratio of total state corporate income taxes to nationwide Gross State Product (GSP) (a measure of statewide economic activity) declined by 30 percent from 1986 to 2013.

An important tax avoidance strategy uses intangible assets to shift income across subsidiaries in different countries and different states (Devereux and Maffini, 2007; Hanlon and Heitzman, 2010). The U.S. tax code (e.g., IRS code section 482) requires firms to use "arm's length price" for intra-firm transactions related to intellectual property (e.g., patents, trademarks and copyrights). The "arm's length price" is the price that two unrelated firms should use in a similar transaction. However, such arm's length principle is hard to enforce, because intangible assets are usually unique and hard to value.

Empirical studies find that firms use discretion over the pricing of such intra-firm transactions to shift income to low-tax areas. Clausing (2003) finds that U.S. multinational firms use lower prices in intra-firm international transactions compared to their transactions with unrelated parties. Harris (1993) and Rego (2003) also find that U.S. multinational firms use foreign subsidiaries to avoid paying domestic taxes. Grubert (2003) estimates that the use of intangible assets accounts for half of the income shifted from high-tax to low-tax countries by U.S. multinational firms. Klassen and Laplante (2012) further show that such income shifting became even more aggressive in recent years.

In other countries, similar tax avoidance strategies have been used. For example, Huizinga and Laeven (2008) find that European firms shift income out of Germany, which is a high-tax country, to reduce the overall tax liability. Using data from the European Patent Office, Böhm et al. (2015) find that European firms strategically locate their patents in countries with low patent taxes to facilitate tax-motivated income shifting. Beuselinck, Deloof, and Vanstraelen (2014)

[6] Similarly, the Citizens for Tax Justice (2011) showed 90 out of the 288 profitable Fortune 500 corporations paid no state income tax in at least one year from 2008 to 2011. See http://ctj.org/90reasons/90ReasonsFull.pdf.

further find that the tax-motivated income shifting by European multinational firms is more pronounced in countries with weak tax enforcement.

Inside the U.S., different states also levy different tax rates on intangible-related income. Firms exploit these differences to avoid paying state income taxes (Citizens for Tax Justice 2011; Gupta and Mills, 2002; Dyreng, Lindsey, and Thornock, 2013). As a domestic tax haven, Delaware does not tax intangible-related income. Many firms transfer their intangible assets (such as trademarks and patents) to a subsidiary established in Delaware. The firm's other subsidiaries pay royalties and other expenses to the subsidiary for the right to use the company's patents, brands, logos or other intangible assets in other states. Because these payments are tax deductible in other states, the firm's overall state income tax is significantly reduced.

2.2 Addback Statutes

To protect against the erosion of the state corporate income tax base, more than 20 U.S. state governments have adopted addback provisions at different time points. While there are subtle differences in the details of the provisions in different states, such addback statutes directly target intra-firm transactions related to intangible assets. Specifically, multi-state firms are required to add back interest and intangible expenses paid to an out-of-state related party to the taxable income reported in the state income tax return. The definitions of intangible expenses are similar in all the states.[7] For example, according to Georgia Code Title 48. Revenue and Taxation § 48-7-28.3, intangible expenses include "Expenses, losses, and costs for, related to, or in connection directly or indirectly with the direct or indirect acquisition, use, maintenance, management, ownership,

[7] A related party is generally defined as a related entity, a component member as defined in IRC section 1563(b), or a person to or from whom there is attribution of stock ownership under section 1563(e). Related parties include members in parent-subsidiary controlled groups and brother-sister controlled groups. See https://www.irs.gov/pub/irs-tege/epchd704.pdf

sale, exchange, or any other disposition of intangible property" and also "Royalty, patent, technical, and copyright fees".

There are three common exceptions to the addback statutes (Borens and Kerner, 2013, p264):

> "the subject-to-tax exception, which may apply when the corresponding item of income received by the related party is subject to tax in the state or another state;
>
> the conduit exception, which may apply when the related party paid the interest or intangible expense to an unrelated party; and
>
> a reasonableness exception that may apply if the taxpayer can prove that limiting the deduction is unreasonable."

However, the application of these exceptions usually has several requirements, and it is difficult for firms to meet these requirements. There is some ambiguity in the interpretations of the exceptions. For example, many firms argue that the subject-to-tax exception should apply as long as the related party is subject to any tax in another state. If so, firms could still avoid taxes through intangible-based income shifting by paying taxes for other income items. However, in recent lawsuits,[8] both the Alabama Supreme Court and New Jersey Tax Court denied such an interpretation. The courts held that the subject-to-tax exception only applies when the income from intangible-related transactions should be subject to the same income taxes in another state. Thus, the adoption of addback statutes is expected to effectively limit corporations from avoiding taxes by income shifting using intangibles.

2.3 Hypothesis

Innovation plays an important role in determining a firm's value and growth (e.g., Hirshleifer, Hsu, and Li, 2013). Understanding the consequences of tax policies to innovation is important for policy makers. Prior literature on the effect of tax policies on innovation can be summarized into

[8] Please see *Surtees v. VFJ Ventures, Inc.*, 8 So.3d 950 (Ala. Ct. Civ. App. 2008), *aff'd* by *Ex parte VFJ Ventures Inc.*, 8 So.3d 983 (Ala. 2008).

two streams. The first stream of studies examines the effect of R&D tax credits and allowances for R&D investments (e.g., Hall, 1993; Hines, 1994; Rao, 2016). Such tax credits explicitly aim to encourage firms to invest in R&D projects, and firms respond positively to R&D tax credits by increasing their R&D investments. Using confidential IRS data from corporate tax returns, Rao (2016) finds that a 10% R&D tax credit increases a firm's research intensity by 19.8%. Cross-country studies (e.g., Hines and Jaffe, 2000; Bloom, Griffith, and Van Reenen, 2002) also find that macro-level R&D investment is also affected by a country's policies regarding R&D tax credits.

Another stream examines the effect of statutory tax rates on innovation. Theoretical models (e.g., Jorgenson, 1963; Hall and Jorgenson, 1969) predict that if R&D investment is tax deductible, statutory tax rates are not expected to have a major impact on R&D projects, because the tax benefits from R&D investment deductions are canceled out by the taxes on taxable income. However, empirical studies (e.g., Mukherjee, Singh, and Žaldokas, 2017) find that higher tax rates negatively affect patenting and R&D investment because of lower after-tax income available for future investment.

We are interested in the impact of addback statutes on corporate innovation. As discussed earlier, addback statutes are designed to crack down on tax-motivated income shifting transactions using intangibles. However, such tax policies imposed by state governments may have an unintentional impact on innovation. Because the role of patents in tax avoidance is limited by addback statutes, the projected net present value (NPV) of R&D projects decreases, resulting in a disincentive to corporate innovation. Further, agency theory of tax avoidance (e.g., Desai, 2005; Desai and Dharmapala, 2006) suggests that managers might extract private benefits from sophisticated tax avoidance transactions. However, addback statutes limit the use of patents in

income shifting and reduce tax avoidance, and thus any private benefits that managers gain from creating patents also shrink. This result discourages managers' personal interest in R&D projects.

Taken together, these arguments lead to the prediction that addback statutes impede corporate innovation. We state this prediction in the alternative form as follows:

***Hypothesis*:** The adoption of addback statutes negatively affects corporate innovation.

There are also reasons why we may not observe evidence consistent with our hypothesis. For example, managers may not take tax savings into consideration when they make investment decisions about R&D projects.[9] Also, it is possible that the addback statutes are not strictly enforced. Further, if managers use innovation and patents to extract rents via for example perquisite consumption they may not reduce innovation and patent filings. Thus, firms' ability to use intangibles to shift taxable income and avoid taxes may not be affected. Therefore, the effect of addback statutes on innovation is an empirical question.

3. Sample, Variable Measurement, and Descriptive Statistics

3.1 Sample

We obtain company financial data from *Compustat* and patent data from Kogan et al. (2017). The matched patent data from Kogan et al. are unavailable for most U.S. firms after 2009.[10] Data on domestic material subsidiaries disclosed in Exhibit 21 of 10-K are from Dyreng, Lindsey, and Thornock (2013). We begin with the sample of US firms between 1999 and 2006 in *Compustat*.

[9] If R&D decisions are made by subsidiary-level managers rather than the top management team, the usefulness of patents in shifting taxable income across subsidiaries/ states may not be incorporated into the R&D investment decisions. But prior literature suggests that a firm's headquarter coordinates its R&D investment decisions (Larsson, 2004). Therefore, the headquarter should consider the tax policies of different states.

[10] The dataset includes the patent data for a small number of firms in 2010. To avoid possible selection bias, we exclude those observations in 2010.

Our sample period starts from 1999 due to the unavailability of statutory state-level tax rate data before 1999, and ends in 2006 to accommodate the requirement for at least three years of subsequent patent data. First, we remove firms that are not taxed as corporations as well as firms with missing CIKs.[11] Following Dyreng, Lindsey, and Thornock (2013), we then restrict the sample to firm-year observations with state effective tax rate between 0 and 0.5,[12] and delete firm-year observations that have both negative state income tax and negative domestic pretax income. Next, we exclude firms in financial industries and utilities industries (i.e., industry groups with two-digit SIC code 60-69 or 49) as well as firms in non-patent industries.[13] Lastly, we require firm-year observations in the sample to have positive book value of equity, as firms with negative book value of equity may have accumulated losses in previous years. Our final sample includes 11,227 firm-year observations, which belong to 3,656 unique firms.

3.2 Variable Measurement

3.2.1 Identifying Affected Firms

Appendix B shows the years in which different states adopted the addback statutes. Following Dyreng, Lindsey, and Thornock (2013), we identify locations where a firm has economic nexus based on domestic material subsidiaries disclosed in Exhibit 21 of 10-K.[14] To identify firms impacted by the adoption of the addback statutes, we construct an indicator variable, *Addback*. We identify a firm as an affected firm if it has at least one subsidiary in a state during the year when the state adopts the addback statutes. For an affected firm, we set *Addback* to 1 for the adoption year and all the subsequent years unless the firm no longer has any subsidiary in a

[11] Non-missing CIK is required as we use domestic material subsidiaries disclosed in Exhibit 21 of 10-K to map out the economic nexus of a firm, following Dyreng, Lindsey, and Thornock (2013).
[12] Results are similar if we require the state effective tax rate to fall into the range [0,1], rather than [0,0.5].
13 We define non-patent industry as a 4-digit SIC group with no patent in Kogan et al. (2017)'s matched patent dataset.
[14] Data on the location of domestic material subsidiaries are from Scott Dyreng's website.

state with addback statutes. If a firm has no subsidiaries in states with addback statutes or all the firm's subsidiaries in states with addback statutes are established after the adoption of addback statutes in those states, *Addback* equals to 0.[15]

3.2.2 Measuring Innovation

Following prior literature on innovation (e.g., Griliches, Hall, and Pakes, 1987), we use patent-based innovation measures for two reasons. First, patent is an output measure that captures both observable and unobservable inputs into innovation (He and Tian, 2013), whereas R&D expense only reflects observable inputs. Second, reported R&D expenditures contain significant measurement errors. Koh and Reeb (2015) find that almost a half of firms in Compustat have missing R&D expenditures data, and a large number of firms with missing R&D expense actually file patents. Specifically, we use patent count and citation count to capture the amount and the quality of innovation. Our innovation variables are constructed using patent data provided by Kogan et al. (2017), which match patent data to firms in CRSP until 2009.

Our first innovation variable is *NPat_3* (*NPat_5*), which is measured as the number of patents filed over the three-year (or five-year) period subsequent to the year in which the key independent variable *Addback* is measured.[16] Our second innovation variable is *NCite_3* (*NCite_5*), which is measured as the number of non-self citations received on patents filed over the subsequent three-year (or five-year) period. To mitigate the truncation bias in citation count, we only include citations received on a patent within the 5-year window starting from the patent's application year. In light of the fact that total citation count increases mechanically with total patent count, we use

[15] To mitigate the concern that firms with low-innovation self-select to operate in states with addback statues, we remove a firm if all its subsidiaries in states with addback statutes are established after the adoption of addback statutes in those states.

[16] We use patent filing date because filing date is closer to the time of the actual innovation (Tian and Wang, 2014).

a third innovation variable (*Avg_Cite*), which is measured as the average number of citations per patent for patents filed over the subsequent three-year or five-year period.

3.3 Descriptive Statistics

The descriptive statistics of the variables used in regression analyses are presented in Table 1, Panel A. As we can see in Panel A, 26% of firm-year observations in the sample have *Addback*=1. An average firm in the sample has total assets of $333.6 million and is 11 years old. The mean state effective tax rate is 3%, which is much lower than the mean statutory tax rate (7 percent), indicating substantial state tax avoidance. Consistent with prior studies on innovation (e.g., He and Tian, 2013), the distributions of patent count and citation count are highly skewed as there are many firm-year observations with zero patent. On average, a firm files 17.38 patents in a three-year period and 24.39 patents in a five-year period. Further, a firm receives 20.78 citations on patents filed in the three-year period and 24.24 citations on patents filed in the five-year period. Panel B further shows the percentage of firms affected by addback statues. We find that more firms are affected by addback statues in later years, consistent with our expectation because more states adopted addback statues in the later part of our sample period.

4. Main Results

4.1 The Effect of Addback Statutes on State ETR

First, to verify the negative effect of addback statutes on state-level tax avoidance, we use model (1) to test whether the adoption of addback statues increases state ETR.

$$\begin{aligned} State\ ETR = {} & \beta_0 + \beta_1 * Addback + \beta_2 * Ln\_AT + \beta_3 * MB + \beta_4 * Leverage + \beta_5 * RD + \beta_6 * CAPEX \\ & + \beta_7 * NOL + \beta_8 * A\_Rate + \beta_9 * PIC\_Separate + \beta_{10} * PIC\_NoNexus \\ & + Ind\ FE + State\ FE + Year\ FE + \mathcal{E} \end{aligned} \quad (1)$$

In model (1), state effective state rate (*State_ETR*) is regressed on *Addback*, which identifies firm-years affected by the addback statutes. Following Dyreng, Lindsey, and Thornock (2013), we compute state effective state rate as state income taxes divided by domestic pretax income.[17] *State_ETR* is an inverse measure of state tax avoidance. Therefore, we predict that the key variable of interest, *Addback,* to be positively associated with *State ETR*. All the subscripts are suppressed, as all these variables are measured in the same time period—year t.

The control variables in our empirical tests include several important firm characteristics: firm size (*Ln_AT*), market-to-book ratio (*MB*), leverage (*Leverage*), R&D expenditures (*RD*), and capital intensity (*CAPEX*) found in prior literature to be associated with corporate tax avoidance. We also control for the following tax-reporting related variables: An indicator variable for tax loss carry forward (*NOL*), weighted-average statutory state tax rate (*A_Rate*), and variables measuring the effect of combined reporting and economic nexus on the firm's ability to shift taxable income and avoid taxes using passive investment companies (PIC) (*PIC_Separate* and *PIC_NoNexus*).[18] Specifically, *NOL* equals to 1 when a firm has tax loss carry forward at the beginning of year t and 0 otherwise, as firms with tax loss carry forward have different incentives for tax planning compared to tax-paying firms. Moreover, *A_Rate* is included to rule out the effect of variation in state-level statutory tax rate across states. The weight is the number of subsidiaries that a firm has in a state. State statutory tax rate data are obtained from Federation of Tax Administrators. We further control for *PIC_Separate* and *PIC_NoNexus* in order to disentangle the effect of addback statues from that of other tax policies such as combined reporting and economic nexus. Combined

[17] Missing state income tax is set to be zero. Missing domestic pretax income is set to be the difference between pre-tax income and foreign pre-tax income. If either pre-tax income or foreign pre-tax income is missing, domestic pretax income is set to be zero.

[18] A "passive investment company" is a company that is set up in a low tax state and holds intangible assets for income shifting purposes.

reporting and economic nexus are intended to curb tax motivated income shifting using PICs. Therefore, *PIC_Separate* is an indicator for firms that likely use PIC strategies and have most of their subsidiaries in states without combined reporting rules. The two PIC variables are constructed following Dyreng et al. (2013): *PIC_NoNexus* is an indicator for firms that likely use PIC strategies and have most subsidiaries in states without economic nexus. We also include industry and year fixed effects. In addition, we control for state fixed effects by including an indicator for each of the 50 U.S. states. The indicator for a state is set to 1 if the firm has at least one material subsidiary in the state, and 0 otherwise. Please see Appendix A for details on variable definitions. All variables are winsorized at the 1st and 99th percentile, except those indicator variables.

The OLS regression results are presented in Table 2. Standard errors are clustered by firm to address the time-series correlations in residuals. In the first column, we only include *Addback* as the independent variable. The second column adds state, industry, and year fixed effects into the regression. The third column further controls for several firm characteristics, including firm size, market-to-book ratio, leverage, R&D expenditure, capital intensity, and tax loss carry forward. Finally, we include the full set of controls in model (1). Consistent with our prediction, the coefficient on *Addback* is positive and significant across all four columns. In Column 4 where all control variables are included, the coefficient is 0.0035, significant at the 1% level. These results indicate that the *State ETR* of firm-years with *Addback*=1 is on average higher than that of firm-years with *Addback*=0, which verifies the conjecture that the adoption of addback statutes limits state tax avoidance.

Coefficients on control variables are generally consistent with expectations. For example, we find that *State ETR* is positively associated with firm size and state statutory tax rates. Further, *State ETR* is negatively associated with market-to-book ratio, leverage, R&D expenditure, capital

intensity, and tax loss carry forward. The R-square in column 4 is about 11.26 percent, suggesting that the model fits well overall.

4.2 The Effect on Innovation

We test our hypothesis of the effect of addback statutes on innovation in subsequent periods using model (2).

$$\begin{aligned} Innovation = {} & \beta_0 + \beta_1 * Addback + \beta_2 * Ln\_AT + \beta_3 * Ln\_Age + \beta_4 * MB + \beta_5 * ROA + \beta_6 * Leverage \\ & + \beta_7 * RD + \beta_8 * CAPEX + \beta_9 * NOL + \beta_{10} * A\_Rate + \beta_{11} * PIC\_Separate \\ & + \beta_{12} * PIC\_NoNexus + Ind\ FE + State\ FE + Year\ FE + \mathcal{E} \end{aligned} \quad (2)$$

The dependent variable in model (2) is *Innovation*, which takes two alternative forms: patent count (*NPat*) and citation count (*NCite*). Patent count is the number of patents that a firm files from year t+1 to year t+3 or from year t+1 to year t+5, while citation count is the number of citations received by patents filed from year t+1 to year t+3 or from year t+1 to year t+5.[19] If the adoption of addback statutes impedes innovation, there will be a significantly negative coefficient on the key variable of interest *Addback*. Fixed effects for the state where a firm has subsidiaries as well as industry fixed effects and year fixed effects are also included in the model, with standard errors being clustered by firms. Given the high skewness of patent count and citation count data, we estimate a Negative Binomial regression model for the tests of *NPat* and *NCite*.[20]

We include several control variables that potentially correlate with both innovation and state tax policies: firm size (*Ln_AT*), firm age (*Ln_Age*), market-to-book ratio (*MB*), profitability (*ROA*), leverage (*Leverage*), R&D expenditures (*RD*), and capital intensity (*CAPEX*), tax loss

[19] In untabulated tests, we also measure innovation based on patent count in year t+3 and citation count in year t+3. Results remain similar.

[20] Poisson regression and Negative Binomial regression are commonly used to analyze count data. The Negative Binomial distribution allows the mean and variance to be different, unlike the Poisson. When the count data exhibits overdispersion, Negative Binomial regression should be used instead of Poisson regression. The patent/citation data are over-dispersed with variance being greater than mean, and thus we use Negative Binomial regression.

carry forward (*NOL*), as control variables to mitigate the confounding effects of these firm characteristics. We also control for statutory state tax rate (*A_Rate*), combined reporting (*PIC_Separate)* and economic nexus rules (*PIC_NoNexus*) to rule out the effect of variation in state-level statutory tax rate and other tax policies across states. Finally, we control for industry, year and state fixed effects.

Table 3 reports the Negative Binomial regression results when *NPat* is the dependent variable. Columns 1 and 2 show results when *NPat* is measured over the subsequent three-year period while Columns 3 and 4 show results when *NPat* is measured over the subsequent five-year period. The coefficient on *Addback* is −0.2906 in Column 2 and −0.2161 in Column 4, significant at 5% level and 10% level respectively, indicating that operating in a state that adopted the addback rule is negatively associated with a firm's innovation in the subsequent three or five years. Therefore, after the adoption of addback statutes in a state, we observe a 1.24 to 1.34 reduction in the number of patents filed by a firm with material subsidiaries in that state during the subsequent three or five years. Regarding control variables, we find that the number of patents filed in the subsequent three or five years is positively associated with firm size, market-to-book ratio, and R&D expenditures. Further, the number of patents filed in the subsequent three or five years is negatively associated with leverage. All these are consistent with our expectations.

Table 4 reports the Negative Binomial regression results when *NCite* is the dependent variable. Columns 1 and 2 show results when the dependent variable is based on the count of citations received on patents filed over the subsequent three-year period while Columns 3 and 4 show results when the dependent variable is based on the count of citations received on patents filed over the subsequent five-year period. The results are consistent with those in Table 3 in that *Addback* is negatively correlated with *NCite,* with the coefficient being −0.3882 in Column 2 and

−0.3122 in Column 4, both significant at the 5% level. Therefore, after the adoption of addback statutes in a state, a firm with material subsidiaries in that state has an approximately 1.37 reduction in the number of citations on patents filed during the subsequent three years. Coefficients on control variables in Table 4 are similar to those in Table 3. Specifically, the number of citations received on patents filed in the subsequent three or five years is positively associated with firm size, market-to-book ratio, R&D expenditures, and capital intensity. Further, the citation count is negatively associated with leverage. Again, these are in line with our expectations.

5. Additional tests

5.1 Are Disappeared Patents of Low Quality?

Our primary tests find that addback statutes have a negative effect on the number of patents filed by a firm. However, the economic implications of the decline in patent count are different depending on whether the patents disappeared as a result of addback statues are of lower or higher quality than other patents. If a firm mainly uses low-quality patents for tax-motivated income shifting, we would expect the negative effect to concentrate on low quality patents. However, firms may not use only low-quality patents in tax avoidance transactions, because high-quality patents have a higher economic value and could be used to shift a larger amount of pretax income. For example, a subsidiary needs to pay more royalty fees to another subsidiary for using a high-quality patent. Therefore, it is unclear whether the quality of the disappeared patents is different.

We infer the quality of patents based on the number of citations. If the quality of the disappeared patents is lower (higher), we expect addback statues to increase (decrease) the average citations of patents. In the following regression model (3), we use *Avg_Cite* as the dependent variable, which is a per-patent measure of citation. As the average number of citations per patent

may not necessarily take the form of integers, we estimate a Tobit model instead of a Negative Binomial model for the test of *Avg_Cite*.

$$Avg\_Cite = \beta_0 + \beta_1 * Addback + \beta_2 * Ln\_AT + \beta_3 * Ln\_Age + \beta_4 * MB + \beta_5 * ROA + \beta_6 * Leverage + \beta_7 * RD + \beta_8 * CAPEX + \beta_9 * NOL + \beta_{10} * A\_Rate + \beta_{11} * PIC\_Separate + \beta_{12} * PIC\_NoNexus + Ind\ FE + State\ FE + Year\ FE + \mathcal{E} \quad (3)$$

As seen in Table 5, Panel A, there is no evidence that addback statues are significantly associated with the quality of an average patent filed in subsequent periods. Therefore, the disappeared patents resulting from tax avoidance crackdown do not seem to be of lower quality than other patents. Further, these findings suggest that the decrease in total citation count subsequent to the adoption of the addback rule is due to the smaller number of patents created rather than lower average quality of each patent.

To further analyze the quality of the disappeared patents, we split the patents filed in the subsequent three or five years into two groups based on whether a patent has any non-self citation in the first five years after filing. Then, we create two variables: the number of patents without any citation (*NPat_NoCite*) and the number of patents with at least one citation (*NPat_Cite*). We re-estimate model (2) after replacing the dependent variable with these two variables. In the first two columns of Table 5, Panel B, we use the number of zero-citation patents as the dependent variable. We find that addback statutes significantly reduce the number of zero-citation patents filed in the subsequent 3 years. In the last two columns, the dependent variable is the number of patents with citations. We find that addback statues are associated with significantly lower number of patents with citations. These findings further support the argument that addback statutes do not just reduce low-quality patents.

5.2 The Effect on Patent Location

In addition to the main finding that the adoption of addback statutes is negatively associated with future innovation, we conduct further analysis to document direct evidence that the adoption of addback statutes reduces firms' incentives to hold intangible assets in Delaware for transfer pricing. As discussed above, royalty income from patents is tax-free in Delaware. Firms can avoid paying state-level income taxes by using patents in Delaware to shift income from other tax states to Delaware. However, if addback statutes discourage firms from holding intangible assets in Delaware, the coefficient β_1 below should be negative and significant.

$$NPat\_DE=\beta_0+\beta_1*Addback+\beta_2*Ln\_AT+\beta_3*Ln\_Age+\beta_4*MB+\beta_5*ROA+\beta_6*Leverage + \beta_7*RD+\beta_8*CAPEX+\beta_9*NOL+\beta_{10}*A\_Rate+\beta_{11}*PIC\_Separate + \beta_{12}*PIC\_NoNexus+ Ind\ FE+ State\ FE+ Year\ FE+ \mathcal{E} \quad (4)$$

The dependent variable in model 4 is *NPat_DE,* which is the number of patents assigned to Delaware subsidiaries during the subsequent three-year period. We rely on the USPTO patent assignment data to identify the states in which patent assignees are located. We count patents assigned to Delaware entities for each firm-year and then construct the variable *NPat_DE* as the number of patents assigned to Delaware assignees during the subsequent period. We restrict the sample to observations with at least one subsidiary in Delaware in the year prior to when *Addback* is measured. We include all controls and fixed effects from model (2). Given that *NPat_DE* is also a positive skewed count variable, we use the Negative Binomial regression model for this test.

Table 6 presents the Negative Binomial regression results from this additional test. Consistent with our prediction, the coefficient on *Addback* is −0.7396 in Column 1 and −0.6226 in Column 2, significant at the 5% level and 10% level, respectively. These results show that the adoption of addback statutes is associated with a lower number of patents firms assign to Delaware

entities in the subsequent period. These findings lend direct support to the arguments that addback statutes reduce firms' use of patents in Delaware for tax-motivated income shifting.

5.3 Do affected firms have lower innovation prior to the effect of addback rules?

We cannot totally exclude the possibility that the adoption decisions of addback statues by state governments are not random. Also, an alternative explanation for our findings is that firms with higher innovation may be less likely to be affected by addback statues. For example, a firm with high innovation may self-select to operate in states that are less likely to take a tough stance against intangible-based income shifting. To mitigate these concerns, we examine whether affected firms have lower innovation prior to the adoption of addback statues by using the follow Negative Binomial regression model (5).

$$NPat=\beta_0+\beta_1*PreAddback+\beta_2*Ln\_AT+\beta_3*Ln\_Age+\beta_4*MB+\beta_5*ROA+\beta_6*Leverage+\beta_7*RD+\beta_8*CAPEX+\beta_9*NOL+\beta_{10}*A\_Rate+\beta_{11}*PIC\_Separate+\beta_{12}*PIC\_NoNexus+Ind\ FE+State\ FE+Year\ FE+\mathcal{E} \quad (5)$$

The independent variable *PreAddback* is an indicator which is set to 1 in the two years before the first year when a firm is affected by addback statues. We exclude observations that are affected by addback statues (*Addback*=1) from the sample.[21] Thus, the coefficient on *PreAddback* shows the difference in innovation between observations of treated firms in the 2-year period before being affected by the addback statues and other observations that are not affected by addback statues . Regression results are reported in Table 7. Across all the columns, we do not find significant coefficients on *PreAddback*. Thus, a firm does not have significantly lower innovation during the two years before it is affected by addback statues. This finding mitigates concerns about firm "self-selections" or non-random adoption decisions by state government.

[21] In untabulated tests, we control for *Addback* instead of excluding observations that are affected by addback statues. Results are similar.

5.4 Non-Financially Constrained Subsample

Another alternative explanation for our findings is that tax avoidance crackdown increases a firm's financial constraints and thus reduces the level of R&D investment (e.g, Edwards, Shevlin and Schwab, 2016). Though this alternative explanation is still consistent with a negative effect of tax avoidance crackdown on innovation, the implications may be different. Therefore, we provide tests to mitigate concerns that the unintended effect on innovation is simply attributed to financial constraints. Specifically, we re-run our primary analyses using a subsample of firms that are not financially constrained. If our findings remain in this subsample, concerns about the alternative explanation should be mitigated.

Regression results are reported in Table 8. We use three measures of financial constraints: KZ index of financial constraints (Lamont, Polk, and Saa-Requejo, 2001), WW index of financial constraints (Whited and Wu, 2006), and dividend payments. Firms with lower KZ index, lower WW index and dividend payments are less financially constrained. In columns 1 and 2, the sample includes observations with KZ index of financial constraint above their industry-year median; in columns 3 and 4, the sample includes firms with WW index of financial constraint above their industry-year median; in columns 5 and 6, the sample includes dividend payers. Panel A uses patent count as the dependent variable. Panel B further uses citation count as the dependent variable. Consistent with our expectations, we still find significantly negative coefficients on *Addback* in most columns. These findings suggest that addback statues have a negative effect on innovation among firms that are not financially constrained. Therefore, the unintended effect on innovation cannot be simply attributed to tax avoidance crackdown increasing financial constraints and thus reducing R&D investments.

5.5 R&D Expenditure Tests

As discussed above, we do not use R&D expenditures as the measure of innovation in the primary tests because of significant measurement errors (Koh and Reeb, 2015). As a robustness check, we provide tests using R&D expenditures as the dependent variable in Table 9. Specifically, we estimate the following Tobit regression model (6).

$$RD\_3\ (RD\_5) = \beta_0 + \beta_1 * Addback + \beta_2 * Ln\_AT + \beta_3 * Ln\_Age + \beta_4 * MB + \beta_5 * ROA + \beta_6 * Leverage + \beta_7 * RD + \beta_8 * CAPEX + \beta_9 * NOL + \beta_{10} * A\_Rate + \beta_{11} * PIC\_Separate + \beta_{12} * PIC\_NoNexus + Ind\ FE + State\ FE + Year\ FE + \mathcal{E} \quad (6)$$

The dependent variable in model 6 is *RD_3* (*RD_5*), which is the average R&D expenditures (scaled by sales) over the subsequent three-year or five-year period. As shown in Table 9, we find significantly negative coefficients on both measures. These findings are consistent with addback statues negatively impacting firms' R&D investment and innovation activities.

6. Conclusion

To crackdown on corporate state tax avoidance, several state governments have adopted addback statutes. In this study, we examine whether the adoption of such addback statutes by U.S. state governments impedes corporate innovation. Specifically, addback statutes require firms to add back intangible-related expenses paid to related parties in other states to the taxable income reported in the state tax return. These provisions prevent firms from using intangible assets to avoid taxes and consequently reduce the benefits that firms and managers can gain from creating intangible assets such as patents. In other words, the projected net present value (NPV) of patents and research and development (R&D) projects decreases.

We examine whether the adoption of addback statutes has an unintentional negative effect on corporate innovation. Our empirical tests employ a sample of U.S. firms from 1999 to 2006. First, we find that after the adoption of addback statutes, the state effective tax rates of firms with material subsidiaries in the state significantly increase, suggesting that addback statutes effectively mitigate tax avoidance. Second, we find that the adoption of addback statutes significantly reduces a firm's innovation, measured by the number of patents or patent citations. Third, the disappeared patents resulting from the tax avoidance crackdown do not seem to be of lower quality than other patents. Fourth, we find that after a state adopts addback statutes, a firm with material subsidiaries in that state assigns fewer patents to entities in Delaware, a domestic tax haven. Finally, compared to other firms not affected by addback statues, a firm does not have lower innovation in the 2 years before being affected by addback statues.

Overall, our findings suggest that the adoption of addback statutes has a significant unintentional negative effect on corporate innovation. The recent Tax Cut and Jobs Act 2017 also includes anti-base-erosion provisions similar to addback statutes, which aim to crackdown on tax-motivated income shifting by US multinational firms to foreign countries with low taxes. Therefore, our study has important implications for policy makers in understanding the net benefits of such tax avoidance crackdown.

Appendix A: Variable Definition

Variable Name	Definition
State_ETR	State effective tax rate, computed as state tax expense (TXS) divided by domestic pre-tax income (PIDOM).
NPat_3 (NPat_5)	The number of patents filed over the subsequent three-year or five-year period.
NCite_3 (NCite_5)	The number of non-self citations (counted over a five-year window starting from the application year of each patent) received on patents filed over the subsequent three-year or five-year period.
Avg_Cite_3 (Avg_Cite_5)	The average number of citations per patent for patents filed over the subsequent three-year or five-year period.
NPat_DE	The number of patents assigned to Delaware entities over the subsequent three-year period.
Addback	Indicator variable, which equals 1 if a firm is affected by addback statutes in a year and 0 otherwise.
Ln_AT	The natural log of total assets (AT).
Ln_Age	The natural log of the number of years for which a firm has existed in *CRSP*.
MB	Market-to-book ratio, computed as the market value of equity (abs(PRCC_F)*CSHO) divided by book value of equity (SEQ).
ROA	Return on assets, computed as operating income before depreciation (OIBDP) divided by total assets (AT).
Leverage	Leverage, computed as the sum of debt in current liabilities (DLC) and long-term debt (DLTT) divided by market value of equity (abs(PRCC_F)*CSHO).
RD	Average R&D expenditures (XRD) scaled by sales (SALE) through the past 3-year period. Missing R&D expense is set to be zero.
CAPEX	Capital expenditures scaled by total assets (AT).
NOL	Indicator variable, which equals 1 if the firm has tax loss carry forward (TLCF) at the beginning of year and 0 otherwise.
A_Rate	Weighted average state statutory tax rates (the weight is the number of subsidiaries that a firm has in a state divided by the total number of subsidiaries of the firm).
PIC_Separate	Indicator variable, which equals 1 when a firm-year meets three criteria: (1) in the upper tercile of the number of subsidiaries in separate filing states, (2) the upper tercile of the number of subsidiaries in Delaware; (3) in the upper half of market-to-book ratio, and 0 otherwise.

PIC_NoNexus	Indicator variable, which equals 1 when a firm-year meets three criteria: (1) in the upper tercile of the number of subsidiaries in NoNexus states; (2) the upper tercile of the number of subsidiaries in Delaware; (3) in the upper half of market-to-book ratio, and 0 otherwise
KZ	Following Lamont, Polk, and Saa-Requejo (2001), we compute KZ index as −1.001909[(ib + dp)/lagged ppent] + 0.2826389[(at + prcc_f × csho - ceq - txdb)/at] + 3.139193[(dltt + dlc)/(dltt + dlc + seq)] − 39.3678[(dvc + dvp)/lagged ppent] − 1.314759[che/lagged ppent]. Firm-year observations with KZ index above industry-year median is considered as financially constrained.
WW Index	Following Whited and Wu (2006), we compute WW index as −0.091*cfo − 0.062*(1 if dv>0, 0 otherwise) + 0.021 *(dltt/at) − 0.044[ln(at)] − 0.035*[(salet-salet-1)/salet-1)]. Firm-year observations with WW index above industry-year median is considered as financially constrained.
Dividend Payer	Indicator variable, which equals to 1 for firms paying dividends in the 5-year period ended in t, and 0 otherwise.
Pre_Addback	Indicator variable, which equals to 1 for the two years prior to a firm being affected by the addback statues, and 0 otherwise.
NPat_NoCite_3 (NPat_NoCite_5)	The number of patents filed from t+1 to t+3 (or t+5) that do not receive citations in the next 5 years starting from filing.
NPat_Cite_3 (NPat_Cite_5)	The number of patents filed from t+1 to t+3 (or t+5) that receive citations in the next 5 years starting from filing.
RD_3 (RD_5)	The average R&D expenditures (scaled by sales) over the subsequent three-year or five-year period

Appendix B: Years in Which States Adopted Addback Statutes

State	Addback Statutes	State	Addback Statutes
Alabama	2001	Montana	
Alaska		Nebraska	
Arizona		Nevada	
Arkansas	2004	New Hampshire	
California		New Jersey	2002
Colorado		New Mexico	
Connecticut	1999	New York	2003
Delaware		North Carolina	2001
Florida		North Dakota	
Georgia	2006	Ohio	1999
Hawaii		Oklahoma	
Idaho		Oregon	2004
Illinois	2005	Pennsylvania	2015
Indiana	2006	Rhode Island	2008 (Repealed in 2015)
Iowa		South Carolina	2005
Kansas		South Dakota	
Kentucky	2005	Tennessee	2004
Louisiana	2016	Texas	
Maine		Utah	
Maryland	2004	Vermont	
Massachusetts	2002	Virginia	2004
Michigan	2008	Washington	
Minnesota		West Virginia	2009
Mississippi	2001	Wisconsin	2009
Missouri		Wyoming	

Notes:

1. We collect the data from the following sources: Guariglia, Shipley and Banks, 2005; Garret and Smith, 2005; Maine and Nguyen, 2017; CCH; Checkpoint. When there are inconsistences between these sources, we further check the state tax code. If the effective date is "after December 31 of a year," we set the effective year to the next year.
2. Michigan used to have a Single Business Tax, which is a VAT. Starting from 2008, Michigan switched to the Michigan Business Tax, which is an income tax. They require adding back intangible expense in the calculation of Michigan Business Tax. In 2011, they officially adopted a corporate income tax, which imposes a 6% taxes on the income of C corporations.
3. Delaware requires firms to addback certain interest expense. But their policy is not related to intangible expense. We do not consider their policy an addback statue.
4. South Carolina's policy does not apply to related party transaction if the payment is made in the same year of the transaction.
5. Wisconsin added intangible expense to the list of addback expenses in 2009; addback statues exists for interest expense from 2008.

6. Ohio' addback statutes apply to all corporations for tax years 1999 and thereafter. For tax years prior to 1999 and after the enactment of the act in 1997, this section applies only to a corporation that has, or is a member of an affiliated group that has, or is a member of an affiliated group with another member that has, one or more of the following:
   (1) Gross sales, including sales to other members of the affiliated group, during the taxable year of at least fifty million dollars;
   (2) Total assets whose asset value at any time during the taxable year is at least twenty-five million dollars;
   (3) Taxable income before operating loss deduction and special deductions during the taxable year of at least five hundred thousand dollars.

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Table 1 Descriptive Statistics

This table presents the descriptive statistics. The sample period is 1999-2006. Panel A shows the mean, standard deviation, and the 1st, 10th, 25th, 50th, 75th, 90th , and 99th percentiles of the variables used in empirical analyses. Panel B shows the percentage of firms affected by addback statues by year. All variables are winsorized at the top and bottom 1%. Please refer to Appendix A for variable definitions.

Panel A Key Variables

Variable	Mean	Std Dev	1st Pctl	25th Pctl	50th Pctl	75th Pctl	99th Pctl
State_ETR	0.03	0.04	0.00	0.00	0.00	0.04	0.22
Addback	0.26	0.44	0.00	0.00	0.00	1.00	1.00
NPat_3	17.38	71.92	0.00	0.00	0.00	2.00	543.00
NPat_5	24.39	104.21	0.00	0.00	0.00	2.00	804.00
NCite_3	20.78	91.43	0.00	0.00	0.00	0.00	700.00
NCite_5	24.24	108.18	0.00	0.00	0.00	0.00	838.00
Avg_Cite_3	0.42	1.18	0.00	0.00	0.00	0.00	7.25
Avg_Cite_5	0.37	1.04	0.00	0.00	0.00	0.00	6.67
NPat_DE_3	0.33	2.27	0.00	0.00	0.00	0.00	20.00
Ln_AT	5.81	1.98	1.18	4.47	5.89	7.11	10.69
Ln_Age	2.51	0.84	0.69	1.95	2.48	3.18	4.03
MB	3.46	5.01	0.24	1.25	2.05	3.56	36.99
ROA	0.06	0.22	−1.07	0.02	0.10	0.17	0.40
Leverage	0.60	1.23	0.00	0.02	0.18	0.57	8.42
RD	0.25	1.23	0.00	0.00	0.00	0.06	10.63
CAPEX	0.06	0.06	0.00	0.02	0.04	0.07	0.35
NOL	0.33	0.47	0.00	0.00	0.00	1.00	1.00
A_RATE	7.35	1.87	0.00	6.60	7.95	8.70	9.99
PIC_Separate	0.33	0.47	0.00	0.00	0.00	1.00	1.00
PIC_NoNexus	0.28	0.45	0.00	0.00	0.00	1.00	1.00

Panel B % of firms affected by addback statutes

	1999	2000	2001	2002	2003	2004	2005	2006
Mean *Addback*	0.14	0.11	0.18	0.26	0.33	0.41	0.42	0.43

Table 2 Effects of Addback Statutes on State ETR

This table presents the OLS regression results on the effects of addback statutes on state-level effective tax rate. The dependent variable is *State_ETR*. The key independent variable is *Addback*, which equals to 1 if a firm operates in a state that has adopted the addback statutes and 0 otherwise. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)
Dependent Variable=	*State_ETR*	*State_ETR*
Addback	0.0036**	0.0036**
	(2.24)	(2.17)
Ln_AT	0.0026***	0.0026***
	(7.92)	(7.26)
MB	−0.0004***	−0.0003***
	(−4.52)	(−3.38)
Leverage	−0.0024***	−0.0023***
	(−4.85)	(−4.17)
RD	−0.0024***	−0.0025***
	(−12.25)	(−12.37)
CAPEX	−0.0133*	−0.0145*
	(−1.71)	(−1.74)
NOL	−0.0050***	−0.0050***
	(−4.52)	(−4.28)
A_Rate		0.0015***
		(3.32)
PIC_Separate		0.0002
		(0.08)
PIC_NoNexus		−0.0017
		(−0.67)
Fixed Effects	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm
Adjusted R-square	0.1073	0.1122
No. of Observations	9,881	8,574

Table 3 Effects of Addback Statutes on Future Patents

This table presents the negative binomial regression results on the effects of addback statutes on the number of patents filed in future periods. In Columns 1&2, the dependent variable is *NPat_3*--the number of patents filed from t+1 to t+3. In Columns 3&4, the dependent variable is *NPat_5*--the number of patents filed from t+1 to t+5. The sample is restricted to 1999-2004 in Columns 3&4 due to the unavailability of patent data after 2009. The key independent variable is *Addback*, which equals to 1 if a firm operates in a state that has adopted the addback statutes and 0 otherwise. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)	(3)	(4)
Dependent Variable=	*NPat_3*	*NPat_3*	*NPat_5*	*NPat_5*
Addback	−0.3148***	−0.2940**	−0.2426*	−0.2236*
	(−2.61)	(−2.52)	(−1.93)	(−1.82)
Ln_AT	1.0040***	0.9984***	1.0062***	1.0012***
	(27.95)	(27.45)	(26.78)	(26.29)
Ln_Age	0.0252	0.0514	0.0118	0.0376
	(0.37)	(0.70)	(0.16)	(0.46)
MB	0.0400***	0.0374***	0.0405***	0.0370***
	(5.36)	(4.36)	(5.49)	(4.03)
ROA	−0.6505**	−0.6050**	−0.5381*	−0.5301*
	(−2.49)	(−2.25)	(−1.93)	(−1.85)
Leverage	−0.6306***	−0.6005***	−0.6010***	−0.5657***
	(−10.38)	(−9.99)	(−11.30)	(−10.82)
RD	0.0500	0.0502	0.0583*	0.0570
	(1.64)	(1.57)	(1.71)	(1.59)
CAPEX	0.9421	0.7355	1.7390*	1.4904
	(1.10)	(0.83)	(1.83)	(1.50)
NOL	−0.0519	−0.0877	−0.0158	−0.0320
	(−0.50)	(−0.81)	(−0.14)	(−0.27)
A_Rate		0.0685*		0.0335
		(1.72)		(0.81)
PIC_Separate		0.0256		−0.0569
		(0.15)		(−0.32)
PIC_NoNexus		0.0906		0.2274
		(0.52)		(1.16)
Fixed Effects	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm	By Firm	By Firm
No. of Observations	9,864	8,561	7,631	6,328

Table 4 Effects of Addback Statutes on Future Citations

This table presents the negative binomial regression results on the effects of addback statutes on the number of citations from patents filed in future periods. In Columns 1&2, the dependent variable is *NCite_3*--the number of citations received on patents filed from t+1 to t+3. In Columns 3&4, the dependent variable is *NCite_5*--the number of citations received on patents filed from t+1 to t+5. The sample is restricted to 1999-2004 in Columns 3&4 due to the unavailability of citation data after 2009. The key independent variable is *Addback*, which equals to 1 if a firm operates in a state that has adopted the addback statute and 0 otherwise. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)	(3)	(4)
Dependent Variable=	*NCite_3*	*NCite_3*	*NCite_5*	*NCite_5*
Addback	−0.3372*	−0.3929**	−0.2684*	−0.3175**
	(−1.92)	(−2.33)	(−1.69)	(−2.03)
Ln_AT	0.9778***	0.9805***	1.0010***	1.0093***
	(23.45)	(23.64)	(22.54)	(22.62)
Ln_Age	−0.0469	−0.0178	−0.1021	−0.0920
	(−0.54)	(−0.19)	(−1.08)	(−0.88)
MB	0.0397***	0.0324***	0.0497***	0.0440***
	(3.61)	(2.66)	(4.97)	(3.86)
ROA	−0.6852**	−0.5550*	−0.5954*	−0.4841
	(−2.12)	(−1.70)	(−1.74)	(−1.38)
Leverage	−0.7182***	−0.6918***	−0.7149***	−0.6832***
	(−10.41)	(−9.80)	(−10.82)	(−10.10)
RD	0.0249	0.0123	0.0327	0.0154
	(0.66)	(0.30)	(0.84)	(0.37)
CAPEX	2.2705**	2.5274**	2.6238**	2.9788**
	(2.06)	(2.17)	(2.22)	(2.32)
NOL	0.0410	−0.0212	0.1320	0.0985
	(0.27)	(−0.14)	(0.96)	(0.68)
A_Rate		−0.0150		−0.0299
		(−0.28)		(−0.55)
PIC_Separate		0.1869		0.1142
		(0.77)		(0.50)
PIC_NoNexus		−0.0096		0.1536
		(−0.04)		(0.61)
Fixed Effects	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm	By Firm	By Firm
No. of Observations	9,864	8,561	7,631	6,328

Table 5 The Quality of Patents Disappeared

Panel A Effects of Addback Statutes on Citations Per Patent

This panel presents the Tobit regression results on the effects of addback statutes on the number of citations per patent for patents filed in future periods. In Columns 1&2, the dependent variable is *Avg_Cite_3*--the number of cites per patent for patents filed from t+1 to t+3. In Columns 3&4, the dependent variable is *Avg_Cite_5*--the number of cites per patent for patents filed from t+1 to t+5. The sample is restricted to 1999-2004 in Columns 3&4 due to the unavailability of citation data after 2009. The key independent variable is *Addback*, which equals to 1 if a firm operates in a state that has adopted the addback statute and 0 otherwise. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)	(3)	(4)
Dependent Variable=	*Avg_Cite_3*	*Avg_Cite_3*	*Avg_Cite_5*	*Avg_Cite_5*
Addback	−0.1057	−0.1084	−0.0839	−0.0835
	(−0.76)	(−0.83)	(−0.59)	(−0.63)
Ln_AT	0.6674***	0.6070***	0.5836***	0.5389***
	(17.23)	(16.26)	(15.56)	(14.80)
Ln_Age	−0.0371	−0.0344	−0.0541	−0.0478
	(−0.47)	(−0.45)	(−0.72)	(−0.65)
MB	0.0340***	0.0221**	0.0270***	0.0165*
	(3.57)	(2.28)	(2.95)	(1.67)
ROA	−0.3980	−0.3402	−0.3257	−0.2657
	(−1.27)	(−1.13)	(−1.11)	(−0.93)
Leverage	−0.6558***	−0.5330***	−0.5509***	−0.4546***
	(−6.48)	(−6.03)	(−6.47)	(−6.00)
RD	0.0738*	0.0761*	0.0691*	0.0758*
	(1.75)	(1.85)	(1.66)	(1.84)
CAPEX	2.2087**	1.6854*	2.2188**	1.8401**
	(2.15)	(1.73)	(2.33)	(1.98)
NOL	−0.0025	−0.0601	0.0505	0.0060
	(−0.02)	(−0.56)	(0.44)	(0.06)
A_Rate		0.0338		0.0029
		(0.78)		(0.07)
PIC_Separate		−0.0747		−0.0918
		(−0.39)		(−0.47)
PIC_NoNexus		0.2204		0.2064
		(1.06)		(0.98)
Fixed Effects	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm	By Firm	By Firm
No. of Observations	9,864	8,561	7,631	6,328

Table 5 The Quality of Patents Disappeared

Panel B Effects of Addback Statutes on Future Patents Without or With Citations

This panel presents the Negative Binomial regression results on the effects of addback statutes on the number of future patents without or with citations. In Model 1 (Model 2), the dependent variable is *NPat_NoCite*--the number of patents filed from t+1 to t+3 (t+5) that do not receive citations in the next 5 years starting from filing. In Model 3 (Model 4), the dependent variable is NPat_Cite --the number of patents filed from t+1 to t+3 (t+5) that receive citations in the next 5 years starting from filing. The sample is restricted to 1999-2004 in Columns 2&4 due to the unavailability of patent data after 2009. The key independent variable is *Addback*, which equals to 1 if a firm operates in a state that has adopted the addback statutes and 0 otherwise. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)	(3)	(4)
Dependent Variable=	*NPat3_NoCite*	*NPat5_NoCite*	*NPat3_Cite*	*NPat5_Cite*
Addback	−0.2569**	−0.1917	−0.3325***	−0.3025**
	(−2.16)	(−1.48)	(−2.61)	(−2.42)
Ln_AT	1.0217***	1.0187***	0.9606***	0.9776***
	(26.92)	(25.48)	(25.95)	(25.47)
Ln_Age	0.0735	0.0740	0.0106	−0.0350
	(1.01)	(0.91)	(0.14)	(−0.41)
MB	0.0388***	0.0381***	0.0358***	0.0425***
	(4.59)	(3.96)	(3.50)	(4.39)
ROA	−0.6329**	−0.5545*	−0.6916**	−0.5774*
	(−2.27)	(−1.83)	(−2.36)	(−1.89)
Leverage	−0.5712***	−0.5427***	−0.5915***	−0.5784***
	(−8.62)	(−9.79)	(−9.13)	(−9.37)
RD	0.0623*	0.0639	0.0164	0.0176
	(1.83)	(1.59)	(0.52)	(0.54)
CAPEX	0.3410	1.1934	1.2390	1.8254
	(0.38)	(1.19)	(1.15)	(1.59)
NOL	−0.1022	−0.0507	−0.0706	−0.0168
	(−0.96)	(−0.42)	(−0.56)	(−0.14)
A_Rate	0.1020**	0.0534	0.0108	0.0071
	(2.44)	(1.16)	(0.24)	(0.16)
PIC_Separate	0.0300	−0.0786	0.2083	0.1088
	(0.18)	(−0.44)	(1.13)	(0.58)
PIC_NoNexus	0.0134	0.1866	−0.0905	0.0357
	(0.08)	(0.95)	(−0.50)	(0.17)
Fixed Effects	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm	By Firm	By Firm
No. of Observations	8,561	6,328	8,561	6,328

Table 6 Effects of Addback Statutes on Patents in Delaware

This table presents the negative binomial regression results on the effects of addback statutes on the number of patents filed by companies in Delaware in future periods. The dependent variable is *NPat_DE_3*--the number of Delaware patents from t+1 to t+3. The key independent variable is *Addback*, which equals to 1 if a firm operates in a state that has adopted the addback statutes and 0 otherwise. The sample is restricted to firm-year observations with at least one subsidiary in Delaware in t-1. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)
Dependent Variable=	*NPat_DE_3*	*NPat_DE_3*
Addback	−0.7145**	−0.5998*
	(−2.17)	(−1.83)
Ln_AT	1.0218***	1.0660***
	(13.83)	(13.47)
Ln_Age	−0.2005	−0.1618
	(−1.08)	(−0.74)
MB	0.0186	−0.0102
	(0.87)	(−0.38)
ROA	1.0144	1.2768
	(1.27)	(1.32)
Leverage	−0.0460	−0.0400
	(−0.52)	(−0.41)
RD	0.1576*	0.1898**
	(1.75)	(1.96)
CAPEX	−3.2708	−4.7223*
	(−1.54)	(−1.92)
NOL	0.3796	0.3564
	(1.23)	(1.03)
A_Rate		0.0546
		(0.39)
PIC_Separate		−0.0264
		(−0.08)
PIC_NoNexus		−0.4142
		(−1.12)
Fixed Effects	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm
No. of Observations	6,344	5,561

Table 7 Do Affected Firms Have Lower Innovation Prior To The Adoption of Addback Statues?

This table tests whether firms have lower innovation before being affected by addback statues than firms that are not affected by addback statues. The key independent variable is *Pre_Addback* which equals to 1 for the two years prior to a firm being affected by the addback statues, 0 otherwise. Observations that are affected by addback statues (*Addback* =1) are removed from the testing samples. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)	(3)	(4)
Dependent Variable=	*NPat_3*	*NPat_3*	*NPat_5*	*NPat_5*
Pre_Addback	−0.0045	0.0572	−0.0580	−0.0536
	(−0.04)	(0.47)	(−0.53)	(−0.49)
Ln_AT	0.9862***	0.9874***	0.9903***	1.0009***
	(27.44)	(26.98)	(25.96)	(25.73)
Ln_Age	0.0126	0.0298	0.0129	0.0371
	(0.19)	(0.41)	(0.17)	(0.46)
MB	0.0406***	0.0375***	0.0418***	0.0365***
	(5.27)	(4.24)	(5.54)	(3.90)
ROA	−0.5024*	−0.4463	−0.4343	−0.4326
	(−1.93)	(−1.64)	(−1.54)	(−1.50)
Leverage	−0.6192***	−0.6007***	−0.5978***	−0.5673***
	(−10.81)	(−10.75)	(−11.50)	(−11.12)
RD	0.0410	0.0400	0.0521	0.0435
	(1.38)	(1.27)	(1.54)	(1.24)
CAPEX	0.9474	0.7341	1.5147	1.3212
	(1.10)	(0.81)	(1.58)	(1.28)
NOL	−0.0793	−0.1190	−0.0561	−0.0856
	(−0.70)	(−1.00)	(−0.48)	(−0.69)
A_Rate		0.0273		−0.0007
		(0.67)		(−0.02)
PIC_Separate		−0.1982		−0.2358
		(−1.06)		(−1.24)
PIC_NoNexus		0.3203		0.4153*
		(1.53)		(1.92)
Fixed Effects	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm	By Firm	By Firm
No. of Observations	7,992	6,689	6,572	5,269

Table 8 Subsample of non-financially constrained firms

Panel A Effect on Patent Count

This table re-runs the primary analyses using subsamples of non-financially constrained firms. Panel A shows the results using patent count as the dependent variable. In Columns 1&2, the sample includes observations with KZ index of financial constraint above industry-year median; in Columns 3&4, the sample includes firms with WW index of financial constraint above industry-year median; in Columns 5 and 6, the sample includes dividend payers. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Low KZ Index		**Low WW Index**		**Dividend Payers**	
Dependent Variable=	***NPat_3***	***NPat_5***	***NPat_3***	***NPat_5***	***NPat_3***	***NPat_5***
Addback	−0.4339***	−0.2723*	−0.4130***	−0.2354	−0.4621***	−0.3484**
	(−2.91)	(−1.67)	(−2.84)	(−1.54)	(−3.02)	(−2.19)
Ln_AT	0.9981***	1.0141***	1.0167***	1.0446***	1.0979***	1.0746***
	(22.01)	(21.75)	(20.68)	(20.66)	(18.23)	(17.98)
Ln_Age	−0.1808*	−0.2222**	0.0823	0.0761	0.2285**	0.3092***
	(−1.90)	(−2.15)	(0.84)	(0.76)	(1.98)	(2.80)
MB	0.0465***	0.0395**	0.0877***	0.0859***	0.0182	0.0251
	(3.77)	(2.51)	(5.09)	(4.50)	(0.95)	(1.12)
ROA	−0.3854	−0.1749	0.0630	0.1551	3.4641***	4.1468***
	(−1.06)	(−0.44)	(0.08)	(0.17)	(3.49)	(4.35)
Leverage	−0.6432***	−0.5393***	−0.7017***	−0.6784***	−0.6023***	−0.5141***
	(−5.01)	(−4.45)	(−8.85)	(−9.25)	(−8.04)	(−7.22)
RD	0.0317	0.0340	0.4947	0.8386	11.5699***	15.6781***
	(0.85)	(0.79)	(1.33)	(0.90)	(2.91)	(5.03)
CAPEX	0.1336	0.7848	−1.6961	−0.4883	−6.9783***	−6.5528***
	(0.12)	(0.61)	(−1.56)	(−0.43)	(−3.89)	(−3.62)
NOL	−0.0114	−0.1368	0.0196	0.0325	−0.1493	−0.1128
	(−0.09)	(−0.91)	(0.17)	(0.25)	(−1.08)	(−0.72)
A_Rate	0.0271	−0.0096	0.1143***	0.1132**	0.0600	0.0569
	(0.53)	(−0.19)	(2.58)	(2.38)	(1.02)	(0.89)

PIC_Separate	−0.2122	−0.2918	−0.0877	−0.0986	0.1852	0.1020
	(−0.97)	(−1.20)	(−0.44)	(−0.43)	(0.78)	(0.36)
PIC_NoNexus	0.0959	0.2379	−0.2125	−0.1965	−0.2781	−0.2804
	(0.42)	(0.94)	(−1.04)	(−0.83)	(−1.17)	(−0.93)
Fixed Effects	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm	By Firm	By Firm	By Firm	By Firm
No. of Observations	4,160	3,080	4,172	3,081	3,117	2,249

Table 8 Subsample of non-financially constrained firms

Panel B Effect on Citation Count

This table reruns the primary analyses using subsamples of non-financially constrained firms. Panel B shows the results using citation count as the dependent variable. In Columns 1&2, the sample includes observations with KZ index of financial constraint above industry-year median; in Columns 3&4, the sample includes firms with WW index of financial constraint above industry-year median; in Columns 5 and 6, the sample includes dividend payers. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Low KZ Index		**Low WW Index**		**Dividend Payers**	
Dependent Variable=	***NCite_3***	***NCite_5***	***NCite_3***	***NCite_5***	***NCite_3***	***NCite_5***
Addback	−0.4512**	−0.4341**	−0.3682**	−0.4446**	−0.4238**	−0.3894*
	(−2.50)	(−2.22)	(−2.11)	(−2.35)	(−2.36)	(−1.96)
Ln_AT	1.0086***	1.0214***	0.9642***	0.9695***	1.1935***	1.2009***
	(19.31)	(18.85)	(16.77)	(16.41)	(17.81)	(17.39)
Ln_Age	0.0386**	0.0504***	0.1022***	0.1134***	0.0338*	0.0341
	(2.46)	(2.64)	(4.97)	(4.74)	(1.80)	(1.63)
MB	−0.4630	−0.2939	−0.4179	−0.6376	4.1243***	5.0974***
	(−0.96)	(−0.57)	(−0.45)	(−0.59)	(4.06)	(4.64)
ROA	−0.3420***	−0.4300***	0.0692	0.0527	0.1390	0.1735
	(−2.81)	(−3.24)	(0.56)	(0.41)	(1.08)	(1.42)
Leverage	−0.8379***	−0.7063***	−0.7407***	−0.7465***	−0.6126***	−0.5680***
	(−5.62)	(−4.86)	(−8.37)	(−8.43)	(−7.48)	(−7.34)
RD	0.0028	0.0032	0.6302	1.2916	12.2618**	17.7206***
	(0.05)	(0.06)	(0.79)	(0.66)	(2.56)	(4.49)
CAPEX	1.9829	2.5515	−2.7527*	−1.7334	−6.5747***	−6.1279***
	(1.31)	(1.50)	(−1.81)	(−1.13)	(−3.11)	(−2.91)
NOL	0.0253	0.0027	0.0972	0.0774	−0.0807	−0.0353
	(0.16)	(0.01)	(0.70)	(0.52)	(−0.51)	(−0.21)
A_Rate	−0.0719	−0.0799	0.0124	0.0324	0.0468	0.0842

	(−1.23)	(−1.32)	(0.21)	(0.52)	(0.73)	(1.27)
PIC_Separate	−0.0582	−0.2735	0.0400	−0.0576	0.1382	−0.1523
	(−0.21)	(−0.96)	(0.16)	(−0.21)	(0.48)	(−0.47)
PIC_NoNexus	0.2070	0.4769	−0.2437	−0.0947	−0.1763	0.0826
	(0.71)	(1.51)	(−0.97)	(−0.32)	(−0.67)	(0.25)
Fixed Effects	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm	By Firm	By Firm	By Firm	By Firm
No. of Observations	4,160	3,080	4,172	3,081	3,117	2,249

Table 9 Effects of Addback Statutes on Future R&D Expenditures

This table presents the Tobit regression results on the effects of addback statutes on R&D expenditures in future periods. In Columns 1&2, the dependent variable is *RD_3*--the average R&D expenditures (scaled by sales) from t+1 to t+3. In Columns 3&4, the dependent variable is *RD_5*--the average R&D expenditures (scaled by sales) from t+1 to t+5. The key independent variable is *Addback*, which equals to 1 if a firm operates in a state that has adopted the addback statute and 0 otherwise. Please refer to Appendix A for variable definitions. All variables in the regressions are winsorized at the top and bottom 1%. All the regressions include an intercept which is not reported. Standard errors are clustered by firm. *, **, and *** refer to significance at 10%, 5%, and 1% level respectively.

	(1)	(2)
Dependent Variable=	*RD_3*	*RD_5*
Addback	−0.0831**	−0.0770**
	(−2.10)	(−1.97)
Ln_AT	0.0332***	0.0237**
	(2.97)	−2.13
Ln_Age	−0.0129	−0.0165
	(−0.51)	(−0.64)
MB	0.0096**	0.0122***
	(2.39)	−3.11
ROA	−1.2555***	−1.3138***
	(−8.31)	(−8.52)
Leverage	−0.1210***	−0.1299***
	(−4.88)	(−5.08)
RD	0.2447***	0.2215***
	(7.61)	−7.03
CAPEX	−1.1065***	−1.0930***
	(−2.74)	(−2.71)
NOL	0.0049	0.0043
	(0.14)	−0.12
A_Rate	0.0174	0.0218
	(1.19)	−1.47
PIC_Separate	0.0525	0.0572
	(0.66)	−0.69
PIC_NoNexus	0.0027	0.0163
	(0.03)	−0.19
FE	Ind, State, Year	Ind, State, Year
SE Clustered	By Firm	By Firm
No. of Observations	8,003	8,011