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## Article

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China Journal of Accounting Research

## Provided in Cooperation with:

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*Suggested Citation:* Francis, Bill B.; Ren, Ning; Wu, Qiang (2017) : Banking deregulation and corporate tax avoidance, China Journal of Accounting Research, ISSN 1755-3091, Elsevier, Amsterdam, Vol. 10, Iss. 2, pp. 87-104,  
<https://doi.org/10.1016/j.cjar.2016.09.004>

This Version is available at:

<https://hdl.handle.net/10419/187664>

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# Banking deregulation and corporate tax avoidance



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## ARTICLE INFO

### Article history:

Received 1 March 2016

Accepted 27 September 2016

Available online 24 November 2016

### Keywords:

Tax avoidance

Interstate banking deregulation

External financing

## ABSTRACT

We investigate whether tax avoidance substitutes for external financing. We exploit interstate banking deregulation as a quasi-external shock to examine whether firms engage in less tax avoidance after banking deregulation, because of cheaper and easier access to credit from banks. We find no empirical evidence to support this substitutive relation, even for firms with higher financial constraints or firms with higher external financing dependence.

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## 1. Introduction

This study examines the substitutive relation between corporate tax avoidance and firms' use of debt. Corporate tax avoidance activities can increase a firm's tax savings, and consequently decrease its reliance on external funding such as debt. The substitution between debt tax shields and non-debt tax shields is modeled theoretically (DeAngelo and Masulis, 1980). However, empirical evidence on this issue is very mixed. Using a sample of 44 tax shelter firms, Graham and Tucker (2006) find empirical evidence that is consistent with the substitutive relation between these two. However, Edwards et al. (2013) find that only firms facing financial constraints exhibit a higher level of tax avoidance. Further, Bradley et al. (1984) find that non-debt tax shields and leverage are positively related, casting doubt on the existence of a significant avoidance-debt-substitution effect.

A major challenge in determining the empirical relation between tax avoidance and the use of debt is that both are endogenous in nature (Graham and Tucker, 2006). We alleviate this concern by exploiting the staggered interstate banking deregulation events in the United States. The Interstate Banking and Branching Efficiency Act (IBBEA) was passed in 1994 and became effective as of 1 June 1997. As described by Rice and Strahan (2010), during this period, states were allowed to erect up to four barriers to protect their local bank-

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ing industry from out-of-state competition. Prior studies find that in states where the restrictions are relaxed, because of increased banking competition, firms have cheaper bank loans and easier access to credit (e.g., Rice and Strahan, 2010; Amore et al., 2013).<sup>1</sup> Therefore, interstate bank deregulation provides an ideal quasi-experiment to examine the substitutive relation between the use of credit and corporate tax avoidance.

Following Rice and Strahan (2010) and Cornaggia et al. (2015), we use *RSindex* to capture the degree of deregulation in different states and at different times. *RSindex* ranges from 0 to 4, indicating how many barriers the state erected after interstate banking deregulation. Firms in states that are open to competition (e.g., *RSindex* value is 0) have easier and cheaper access to bank loans than firms in less open states (e.g., *RSindex* value is 4).

We construct tests using staggered interstate banking deregulation events as exogenous shocks to the credit supply and the cost of bank loans. If the substitutive relation between cash savings from tax avoidance and external financing holds, we expect to observe a decrease in firms' tax avoidance practices after interstate deregulation when they have easier and cheaper access to external financing (i.e., bank loans). Therefore, we expect *RSindex* to be positively associated with tax avoidance.

Given that we are interested in broad tax avoidance strategies that could reduce the firm's explicit taxes, following Dyreng et al. (2010), Hope et al. (2013) and Hasan et al. (2014), among others, we use the effective tax rate (*GAAP ETR*), cash effective tax rate (*Cash ETR*), discretionary book-tax difference (*Discretionary BT*, as in Desai and Dharmapala (2006)) and discretionary permanent book-tax difference (*DTAX*, as in Frank et al. (2009)), as our measures of tax avoidance.

In our baseline model, we collect all available observations around interstate deregulation events (pooled sample) and control for standard determinants of tax avoidance. We find that the coefficients on *RSindex* are not statistically significant for all four measures of tax avoidance. Therefore, our results do not provide supportive evidence for the substitutive relation between tax avoidance practices and external financing. We further constrain our sample to different event windows and find similar results.

According to Edwards et al. (2013), firms with higher financial constraints are more likely to exploit cash savings from tax avoidance practices. To examine whether the substitutive relation holds for firms with higher financial constraints, we divide our sample into two subgroups based on firms' financial constraint levels and perform the baseline model using these subsamples.<sup>2</sup> We find that interstate banking deregulation has no significant effect on corporate tax avoidance even for firms that are facing higher financial constraints.

We further examine whether the extent to which companies depend on external finance affects the substitutive relation between tax avoidance and external financing. We assume that firms with higher dependence on external finance are more likely to be affected by interstate banking deregulation. The easier access to and lower cost of bank loans should make it easier for firms to access external funding, especially firms that are highly dependent on external financing. We perform subsample tests based on the measure of firms' external finance dependence developed by Duchin et al. (2010). We find that the coefficients on *RSindex* are not statistically significant, even for firms with higher dependence on external financing. In summary, we fail to find that interstate banking deregulation has a significant effect on firms' tax avoidance behavior, even when firms are facing financial constraints or highly dependent on external financing.

This study contributes to a growing stream of literature that examines the determinants of tax avoidance. Previous studies find very mixed results with regard to the relation between the use of debt and corporate tax avoidance. In our paper, we use banking deregulation as a natural experiment to better identify the effect of external financing shocks on tax avoidance behavior. Our empirical evidence fails to find a significant substitutive relation between tax avoidance and the use of debt, even for firms with financial constraints. Our paper sheds light on the debate in this research field. Our paper also contributes to the banking literature that examines the real effects of banking deregulation on corporate decision-making.

<sup>1</sup> Using DealScan dataset, we examine how interstate banking deregulation affects the costs and amounts of bank loans for US public firms. We find that bank loan spreads are significantly reduced and bank loan amounts are significantly increased after banking deregulation.

<sup>2</sup> We also perform an interaction model, interacting *RSindex* with the dummy variable *high\_KZ* score. The results are consistent with the subsample regressions.

The rest of the paper proceeds as follows. Section 2 develops the hypothesis on the substitutive relation between cash savings from tax avoidance and external finance. Section 3 describes the sample. Section 4 presents the empirical results. Section 5 provides the subsample analyses and Section 6 explores the effect of intrastate deregulation. Section 7 concludes.

## 2. Hypothesis development

Numerous studies focus on the effects of firm-level characteristics on tax avoidance (e.g., [Chen and Chu, 2005](#); [Desai and Dharmapala, 2006](#); [Wilson, 2009](#); [Armstrong et al., 2012](#); [Hoi et al., 2013](#)). However, many research questions remain unanswered. [Maydew \(2001\)](#) and [Hanlon and Heitzman \(2010\)](#) suggest that the theoretical and empirical tax research from the accounting, finance and economics fields should be integrated to provide a more in-depth perspective on this issue. In this paper, we examine whether cash savings from tax avoidance can be substituted for the use of debt.

Prior tax avoidance studies suggest that tax planning is not free. In fact, it can be very costly to build up complex tax avoidance strategies ([Desai and Dharmapala, 2006](#)). Similar to raising funds from external sources, managers need to exploit unused tax strategies and consider the potential cost of cash savings from tax planning. According to [Edwards et al. \(2013\)](#), the implicit discount rate of funds is determined by (1) the amount of cash saved from tax planning, (2) the expected timing of eventual repayment (if at all), (3) potential penalties if caught by the tax authorities and (4) the cost of designing and implementing additional tax strategies. Not all of these costs apply to every tax strategy. For example, deferral strategies are similar to an interest-free loan obtained from the government, but firms eventually need to repay them. When firms use permanent tax avoidance strategies, they may avoid paying back the taxes if they are not sued by the tax authorities, but otherwise they will pay high penalties and interest on the tax owed to the tax authorities.<sup>3</sup>

[DeAngelo and Masulis \(1980\)](#) theoretically model the substitution between debt tax shields and non-debt tax shields. They argue that tax deductions from tax avoidance (e.g., tax sheltering) are non-debt tax shields, and non-debt tax shields can be substituted for tax deductions from debt interest. [DeAngelo and Masulis \(1980\)](#) show that a firm has an optimal amount of total tax deductions. If a firm uses more non-debt tax shields, it will use fewer debt tax deductions. [Graham and Tucker \(2006\)](#) empirically test [DeAngelo and Masulis's \(1980\)](#) theory. Using a sample of 44 tax shelter firms, [Graham and Tucker \(2006\)](#) find evidence to support the substitutive relation between tax avoidance and the use of debt. However, other studies using larger samples find very mixed results. For example, [Edwards et al. \(2013\)](#) find that the substitutive relation only exists for firms facing financial constraints. [Bradley et al. \(1984\)](#) find the totally opposite result that non-debt tax shields and leverage are positively related.

Extant studies have examined the real effects of banking deregulation. [Jayaratne and Strahan \(1996\)](#) suggest that bank deregulation significantly increases the rates of real per capita growth in income and output. [Black and Strahan \(2002\)](#) find that deregulation spurs entrepreneurship and helps small business and new business flourish. [Morgan et al. \(2004\)](#) find that the state-level business cycle is generally less volatile after the interstate banking regulation and the associated financial integration. A more related study by [Rice and Strahan \(2010\)](#) finds that after interstate banking deregulation, small firms have a lower cost of debt and easier access to bank loans in states that are more open to branching. [Amore et al. \(2013\)](#) find that interstate bank deregulation is associated with an 8% increase in the total net loan supply. Recent studies use bank deregulation as an exogenous shock to the credit supply and examine how it affects corporate decisions and outcomes (e.g., [Rice and Strahan, 2010](#); [Amore et al., 2013](#); [Francis et al., 2014](#); [Cornaggia et al., 2015](#)). Based on these studies, we examine whether states' openness to branching directly affects firms' tax avoidance behavior. The openness to branching is positively correlated with lower loan costs and easier access to credit; hence, we are able to use these staggered deregulation events to test whether cash savings from tax avoidance substitute for external financing.

<sup>3</sup> [Andreoni \(1992\)](#) models this tax avoidance behavior. This discussion does not include the costs associated with implementing tax planning strategies. [Mills et al. \(1998\)](#) estimate that for every \$1 invested in general tax planning, although these costs are not trivial, firms have an average return of approximately \$4.

In sum, we predict that in states that are more open to branching after interstate deregulation, firms are more likely to reduce their tax avoidance practices because they have easier access to lower cost bank loans. We propose the following hypothesis:

H1: Tax avoidance is negatively correlated with states' openness to branching.

### 3. Sample and summary statistics

#### 3.1. Sample

To investigate the effect of banking deregulation on corporate tax avoidance, we obtain data from two sources. We obtain data on interstate banking deregulation from [Rice and Strahan \(2010\)](#) and financial information from Standard & Poor's Compustat. Following the tax avoidance literature, we exclude firms in the utility (SIC codes 4900–4949) and finance (SIC codes 6000–6999) industries. We merge the firm data from Compustat with the deregulation data if a firm is headquartered in the same state as the deregulation state. After dropping missing information, we finally have 48,013 firm-year observations for 7,374 unique firms in 50 states. [Table 1](#) reports the sample distribution by fiscal year. The firm-year observations are relatively evenly distributed from 1987 to 2010.

#### 3.2. Variables

We construct a variable named *RSindex* following [Rice and Strahan \(2010\)](#). As described in [Rice and Strahan \(2010\)](#), the IBBEA allowed states to erect out-of-state entry barriers from the time of enactment in 1994 until 1 June 1997. States could use any combination of the following four provisions to set their barriers to interstate branching: (i) a minimum age for the target institution; (ii) de novo interstate branching; (iii) the

Table 1  
Sample distribution.

| Fiscal year | Frequency | Percent |
|-------------|-----------|---------|
| 1987        | 1983      | 4.13%   |
| 1988        | 2044      | 4.26%   |
| 1989        | 1912      | 3.98%   |
| 1990        | 1917      | 3.99%   |
| 1991        | 1864      | 3.88%   |
| 1992        | 1986      | 4.14%   |
| 1993        | 2132      | 4.44%   |
| 1994        | 2413      | 5.03%   |
| 1995        | 2450      | 5.10%   |
| 1996        | 2631      | 5.48%   |
| 1997        | 2666      | 5.55%   |
| 1998        | 2408      | 5.02%   |
| 1999        | 2326      | 4.84%   |
| 2000        | 2113      | 4.40%   |
| 2001        | 1681      | 3.50%   |
| 2002        | 1758      | 3.66%   |
| 2003        | 1845      | 3.84%   |
| 2004        | 1983      | 4.13%   |
| 2005        | 1940      | 4.04%   |
| 2006        | 1857      | 3.87%   |
| 2007        | 1744      | 3.63%   |
| 2008        | 1441      | 3.00%   |
| 2009        | 1362      | 2.84%   |
| 2010        | 1557      | 3.24%   |
| Total       | 48,013    | 100%    |

This table presents the number and percentage of firm-year observations for the 1987 to 2010 period.

Table 2  
Summary statistics.

| Variable         | N      | Mean    | Median | STD    |
|------------------|--------|---------|--------|--------|
| <i>Panel A</i>   |        |         |        |        |
| Cash ETR         | 38,158 | 0.2911  | 0.2774 | 0.2358 |
| GAAP ETR         | 41,482 | 0.3278  | 0.3639 | 0.1679 |
| Discretionary BT | 17,555 | 0.0379  | 0.0330 | 0.1152 |
| DTAX             | 30,053 | −0.0027 | 0.0020 | 0.3358 |
| <i>Panel B</i>   |        |         |        |        |
| RSindex          | 48,013 | 2.7998  | 3.0000 | 1.4161 |
| ROA              | 48,013 | 0.1175  | 0.0867 | 0.1961 |
| Leverage         | 48,013 | 0.1903  | 0.1267 | 0.3822 |
| Size             | 48,013 | 5.2786  | 5.2332 | 2.1512 |
| LagMB            | 48,013 | 2.9374  | 2.0149 | 3.5309 |
| NOL              | 48,013 | 0.2776  | 0.0000 | 0.4478 |
| Delta_gdwill     | 48,013 | 0.0282  | 0.0000 | 0.1565 |
| New investment   | 48,013 | 0.0738  | 0.0439 | 0.1164 |
| Foreign asset    | 48,013 | 0.3875  | 0.0000 | 0.4872 |
| Cash             | 48,013 | 0.1930  | 0.0887 | 0.3397 |

The full sample contains 48,013 firm-year observations for 7374 distinct firms from 1987 to 2010. Panel A presents the descriptive statistics for tax avoidance measures. Panel B presents the descriptive statistics for firm characteristics. Detailed definitions and measurements for all variables can be found in the Appendix.

acquisition of individual branches; and (iv) a statewide deposit cap. *RSindex* represents the number of provisions a state sets on interstate branching. Therefore, *RSindex* ranges from 0 to 4. States that have an *RSindex* of 0 are the most open toward branching and vice versa.<sup>4</sup>

Hanlon and Heitzman (2010) state that “if tax avoidance represents a continuum of tax planning strategies where something like municipal bond investments are at one end, then terms such as ‘noncompliance,’ ‘evasion,’ ‘aggressiveness,’ and ‘sheltering’ would be closer to the other end of the continuum.” We are interested in all tax avoidance strategies that could reduce explicit taxes. Following studies such as Dyreng et al. (2010), Hope et al. (2013) and Hasan et al. (2014), we use four measures to capture this continuum. Two alternate tax rate measures, *GAAP ETR* and *Cash ETR*, are used to estimate broad tax avoidance practices (Dyreng et al., 2010; Hanlon and Heitzman, 2010). *GAAP ETR* is the ratio of total tax expenses to pretax income for a firm in a given year. *Cash ETR* is the ratio of cash tax paid to pretax income for a firm in a given year. By definition, a higher *GAAP ETR* or *Cash ETR* value means less corporate tax avoidance.

Two measures of book-tax difference are used to capture more aggressive tax planning strategies. Book-tax difference is a reasonable measure of more aggressive tax avoidance. For instance, Mills et al. (1998) find that firms with large book-tax differences are more likely to be audited by the IRS and have larger proposed audit adjustments. Wilson (2009) finds that book-tax differences are larger for firms accused of engaging in tax shelters than for a matched sample of non-accused firms. Our book-tax difference measures are (1) the Desai and Dharmapala (2006) discretionary book-tax difference (*Discretionary BT*) and (2) the Frank et al. (2009) permanent discretionary book-tax difference (*DTAX*). Higher *Discretionary BT* or *DTAX* means more aggressive tax avoidance.

Following the literature, we control for a vector of firm characteristics that may affect a firm’s tax avoidance practice. Variable definitions are presented in the Appendix.

### 3.3. Summary statistics

In Table 2, Panel A reports the summary statistics of measures that capture tax avoidance practices. Due to the data requirement when constructing these measures, the sample sizes vary from 17,555 for *Discretionary*

<sup>4</sup> See Rice and Strahan (2010) for a detailed discussion and information about interstate deregulation.



*BT* to 41,482 for *GAAP ETR*. The sample statistics for these tax avoidance measures are similar to those in the extant tax literature (e.g., Dyreng et al., 2008; Hasan et al., 2014).

In Table 2, Panel B shows the summary statistics of *RSindex* and other control variables for the full sample. The mean of *RSindex* is about 2.80 with a standard deviation of 1.41, consistent with the study by Cornaggia et al. (2015). The statistics of the other control variables are in the range of those reported in previous studies (e.g., Armstrong et al., 2012).

## 4. Empirical results

### 4.1. Baseline regression results

Following Rice and Strahan (2010) and Cornaggia et al. (2015), we use interstate banking deregulations as external shocks to the supply and the price of bank loans. The staggered multiple deregulation events alleviate the problem associated with a single shock design, and exclude the possibility of some omitted factors coinciding with the shock that could affect the dependent variable. We estimate the following model:

$$\text{Tax Avoidance Measure}_{\{i,t\}} = \alpha + \beta_1 \text{RSindex}_{\{i,t\}} + \gamma Z_{\{i,t\}} + \text{industry}_{\{i,t\}} + \text{year}_t + \text{State}_i + \epsilon_{\{i,t\}} \quad (1)$$

*RSindex* is the key independent variable, indicating the openness of the state toward out-of-state banking competition. Following the tax avoidance literature, we include relevant firm characteristics that may affect tax avoidance. We include the state fixed effect to control for omitted time-invariant state factors that might be correlated with tax avoidance practices such as the legal environment and the strictness of the tax authority.<sup>5</sup> We also control for year and industry fixed effects in the model.

Table 3 presents the results for the baseline OLS regression model in Eq. (1) and the adjusted standard errors for within-firm clustering and heteroscedasticity. The first column represents the regression result for *Cash ETR*. The estimated coefficient is 0.0017 and is not statistically significant, suggesting that interstate banking deregulation has no significant effect on firms' tax avoidance practices. The coefficients on the control variables are generally consistent with previous studies.

Column 2 shows the regression results for *GAAP ETR*. The results are similar to those in Column 1: the coefficient on *RSindex* is positive, but not significantly correlated with *GAAP ETR*. We present the regression results for *Discretionary BT* and *DTAX* in Columns 3 and 4. Consistent with effective tax rate-based tax avoidance measures, the coefficients on *RSindex* are not significant, further suggesting that interstate banking deregulation has no significant effect on firms' tax avoidance practices.

We further include observations for a (−3,+3)-year window around interstate deregulation events and perform the baseline regression model. Table 4 presents the results for the (−3,+3)-year window sample. We exclude observations in the year of the interstate deregulations. Because by eliminating some potential policy or business environment changes in the state over the long run, we can obtain a relatively clear view of how interstate deregulation could change tax avoidance behavior. The results for *Cash ETR*, *GAAP ETR*, *Discretionary BT* and *DTAX* are presented separately in Columns 1 to 4. The results in these regressions are consistent with those in Table 3, indicating that there is no significant effect of banking deregulation on corporate tax avoidance.

### 4.2. Robustness checks

In this section, we perform a series of robustness tests to ensure that our baseline regression results hold. We discuss the purposes and results of these additional analyses below.

We use four dummy variables to represent the different values of *RSindex*. For example, dummy variable *RSindex\_0* equals 1 if the value of *RSindex* is 0; we also create *RSindex\_1*, *RSindex\_3* and *RSindex\_4*. We add these dummy variables to the baseline model instead of using *RSindex*. Therefore, the group with an *RSindex*

<sup>5</sup> Different regions may have different levels of tax enforcement. Instead of controlling for state fixed effects, in a robustness check we control for region fixed effects and our main results hold.

Table 3  
Baseline regression.

|                        | (1)<br>Cash ETR          | (2)<br>GAAP ETR          | (3)<br>Discretionary BT | (4)<br>DTAX            |
|------------------------|--------------------------|--------------------------|-------------------------|------------------------|
| RSindex                | 0.0017<br>(0.9956)       | 0.0007<br>(0.7131)       | 0.0003<br>(0.0013)      | −0.0008<br>(0.0028)    |
| ROA                    | −0.2118***<br>(−7.4763)  | 0.0858***<br>(5.0456)    | 0.0747**<br>(0.0297)    | 0.0431<br>(0.0483)     |
| Leverage               | −0.0621***<br>(−8.0785)  | 0.0364***<br>(6.7664)    | −0.0441**<br>(0.0159)   | −0.0111<br>(0.0183)    |
| Size                   | 0.0124***<br>(12.2466)   | 0.0133***<br>(8.2805)    | 0.0022***<br>(0.0008)   | −0.0112***<br>(0.0035) |
| LagMB                  | −0.0032***<br>(−5.4214)  | −0.0047***<br>(−13.2120) | −0.0004<br>(0.0004)     | 0.0050***<br>(0.0007)  |
| NOL                    | −0.0805***<br>(−10.7323) | −0.0378***<br>(−12.0038) | 0.0115***<br>(0.0016)   | 0.0105<br>(0.0125)     |
| Delta_gdwill           | 0.0355**<br>(2.6893)     | 0.0111*<br>(1.9487)      | −0.0060<br>(0.0174)     | −0.0309<br>(0.0493)    |
| New investment         | 0.0622***<br>(3.2485)    | 0.0029<br>(0.2394)       | −0.1405***<br>(0.0187)  | 0.0138<br>(0.0415)     |
| Foreign assets         | 0.0060*<br>(1.8755)      | 0.0116***<br>(4.6355)    | −0.0030<br>(0.0081)     | −0.0041<br>(0.0040)    |
| Cash                   | −0.0487***<br>(−4.9564)  | −0.0631***<br>(−9.7433)  | 0.0048<br>(0.0091)      | 0.0321**<br>(0.0140)   |
| Control for            |                          |                          |                         |                        |
| Year fixed effects     | Yes                      | Yes                      | Yes                     | Yes                    |
| Industry fixed effects | Yes                      | Yes                      | Yes                     | Yes                    |
| State fixed effects    | Yes                      | Yes                      | Yes                     | Yes                    |
| N                      | 35,540                   | 38,761                   | 17,555                  | 30,053                 |
| adj. R <sup>2</sup>    | 0.099                    | 0.116                    | 0.089                   | 0.082                  |

This table presents the regression results of the baseline model using the full sample. The dependent variable is cash effective tax rates (Cash ETR), GAAP effective tax rates (GAAP ETR), discretionary book-tax difference (Discretionary BT) and discretionary permanent differences (DTAX) in columns 1, 2, 3 and 4, respectively. The key independent variable is *RSindex*, ranging from 0 to 4. All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroskedasticity and within-year clustering.

\* Significance level at 10%.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

value of 2 is considered as the reference group. Table 5 shows the regression results using this model. Only 2 of the 16 coefficients are significant. Specifically, the coefficient on *RSindex\_1* is 0.023 and significant at the 5% level when we use *Cash ETR* as the dependent variable, suggesting that firms in states where *RSindex* equals 1 pay more effective cash tax than firms in states where *RSindex* equals 2. The results also show that the *GAAP ETR* is significantly lower for firms in states where *RSindex* equals 3 than that for firms in states where *RSindex* equals 2. Overall, we find no other significant differences for the other tax measures and groups.

To estimate the possibility of a nonlinear relation, we perform two nonlinear regression models using *logRSindex* and *sqrRSindex*, separately. *logRSindex* equals the natural logarithm of 1 plus *RSindex*. Table 6 presents the regression results. Consistent with the main findings, interstate deregulation is not significantly correlated with tax avoidance measures. *sqrRSindex* equals the square of *RSindex*. To perform the nonlinear model, we include both *RSindex* and *sqrRSindex* in the regressions. The results presented in Table 7 show that the coefficients on these two independent variables are not statistically significant for the four tax avoidance measures, consistent with the main findings.

To compare the states at the two ends of the spectrum of openness toward branching deregulation, we perform a test using a subsample of firms at the two extremes. More specifically, the subsample includes only states with an *RSindex* value of 0 (totally open to branching) and 4 (most restrictive to branching) up to 1 June 1997. We also include firm-year observations in these states before the IBBEA effective date. *BranchRes-*



Table 4  
Baseline Regression: (−3,+3) window.

|                     | (1)<br>Cash ETR          | (2)<br>GAAP ETR          | (3)<br>Discretionary BT | (4)<br>DTAX             |
|---------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| RSindex             | 0.0016<br>(0.6686)       | −0.0009<br>(−0.5925)     | −0.000511<br>(0.0021)   | −0.00332<br>(0.0040)    |
| ROA                 | −0.2130***<br>(−5.6665)  | 0.0927***<br>(3.4587)    | 0.0530<br>(0.0509)      | −0.00591<br>(0.0444)    |
| Leverage            | −0.0580***<br>(−5.8900)  | 0.0536***<br>(10.6479)   | −0.0346**<br>(0.0154)   | 0.00627<br>(0.0201)     |
| Size                | 0.0159***<br>(19.7406)   | 0.0197***<br>(20.1228)   | 0.00184*<br>(0.0010)    | −0.00843***<br>(0.0020) |
| LagMB               | −0.0034***<br>(−4.2939)  | −0.0059***<br>(−9.8702)  | −0.000583<br>(0.0005)   | 0.00366***<br>(0.0011)  |
| NOL                 | −0.0883***<br>(−12.7228) | −0.0478***<br>(−17.3449) | 0.0149***<br>(0.0030)   | 0.0314***<br>(0.0038)   |
| Delta_gdwill        | 0.0276***<br>(2.1552)    | 0.0022<br>(0.1552)       | −0.0550<br>(0.0385)     | −0.0113<br>(0.0297)     |
| New investment      | 0.1034***<br>(7.2861)    | 0.0330***<br>(3.9054)    | −0.141***<br>(0.0270)   | 0.0233<br>(0.0264)      |
| Foreign assets      | −0.0005<br>(−0.1023)     | 0.0102***<br>(3.6559)    | 0.0204**<br>(0.0096)    | −0.00285<br>(0.0058)    |
| Cash                | −0.0311***<br>(−2.6852)  | −0.0506***<br>(−10.3616) | −0.00198<br>(0.0117)    | 0.0292*<br>(0.0169)     |
| N                   | 15,541                   | 16,202                   | 6,434                   | 11,590                  |
| adj. R <sup>2</sup> | 0.095                    | 0.148                    | 0.117                   | 0.061                   |

This table presents the regression results of the baseline model using the (−3,+3) window sample. The dependent variable is cash effective tax rates (Cash ETR), GAAP effective tax rates (GAAP ETR), discretionary book-tax difference (Discretionary BT) and discretionary permanent differences (DTAX) in columns 1, 2, 3 and 4, respectively. The key independent variable is RSindex, ranging from 0 to 4. All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroskedasticity and within-year clustering.

\* Significance level at 10%.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

*trict* is a dummy variable that equals 1 if the state implements four provisions by 1 June 1997, and 0 otherwise. *After* is a dummy variable that equals 1 when the fiscal year of the firm observation is after 1997. We drop the observations in the 1997 fiscal year to avoid contamination effects. We are interested in the variable *Restrict\_After*, which is an interaction term between *BranchRestrict* and *After*. This research design is similar to a standard difference-in-differences method.

Table 8 presents the regression results for this difference-in-differences test. The results show that states that are restrictive to branching consistently pay lower *GAAP ETR*. *Discretionary BT* is significantly higher after the interstate deregulation event. For the interaction term *Restrict\_After*, it is significant at the 10% level when we use *DTAX* as the measure of tax avoidance, but it is not significant for the three other measures of tax avoidance. The results in general suggest that there is no significant relation between banking deregulation and tax avoidance practices.

It is possible that different regions may have different levels of tax enforcement. To mitigate this regional effect, we perform a robustness check to examine whether our main results are affected by region. Specifically, following the United States Census Bureau definition, we divide states into four regions: Northeast, Midwest, South and West. We then add region as a fixed effect to our baseline model. We find that our main results are unchanged after controlling for region. Finally, we test whether our results are driven by large states with more observations. Specifically, we drop observations from California, the state with the largest number of observations. We also drop observations from California, Texas and New York, the top three states in terms of the number of observations. Our main results hold for these robustness checks, suggesting that our results are not driven by certain large states. For brevity, the results of these robustness checks are not tabulated.

Table 5  
Robustness test 1.

|                        | (1)<br>Cash ETR        | (2)<br>GAAP ETR        | (3)<br>Discretionary BT | (4)<br>DTAX            |
|------------------------|------------------------|------------------------|-------------------------|------------------------|
| RSindex_0              | −0.0039<br>(0.0098)    | −0.0066<br>(0.0046)    | 0.0081<br>(0.0085)      | −0.0017<br>(0.0205)    |
| RSindex_1              | 0.0230**<br>(0.0082)   | −0.0049<br>(0.0048)    | 0.0014<br>(0.0114)      | −0.0088<br>(0.0157)    |
| RSindex_3              | −0.0066<br>(0.0079)    | −0.0112**<br>(0.0046)  | 0.0002<br>(0.0058)      | −0.0202<br>(0.0166)    |
| RSindex_4              | 0.0135<br>(0.0090)     | −0.0071<br>(0.0057)    | 0.0052<br>(0.0076)      | −0.0120<br>(0.0100)    |
| ROA                    | −0.2132***<br>(0.0374) | 0.0926***<br>(0.0268)  | 0.0534<br>(0.0361)      | −0.0062<br>(0.0357)    |
| Leverage               | −0.0580***<br>(0.0099) | 0.0536***<br>(0.0050)  | −0.0345***<br>(0.0071)  | 0.0062<br>(0.0154)     |
| Size                   | 0.0161***<br>(0.0008)  | 0.0197***<br>(0.0010)  | 0.0018**<br>(0.0009)    | −0.0084***<br>(0.0019) |
| LagMB                  | −0.0034***<br>(0.0008) | −0.0059***<br>(0.0006) | −0.0006<br>(0.0006)     | 0.0037***<br>(0.0009)  |
| NOL                    | −0.0882***<br>(0.0069) | −0.0477***<br>(0.0028) | 0.0150***<br>(0.0019)   | 0.0315***<br>(0.0050)  |
| Delta_gdwill           | 0.0274**<br>(0.0128)   | 0.0021<br>(0.0143)     | −0.0550***<br>(0.0147)  | −0.0116<br>(0.0338)    |
| New investment         | 0.1032***<br>(0.0139)  | 0.0332***<br>(0.0084)  | −0.1407***<br>(0.0186)  | 0.0231<br>(0.0297)     |
| Foreign assets         | −0.0005<br>(0.0045)    | 0.0101***<br>(0.0028)  | 0.0204**<br>(0.0094)    | −0.0030<br>(0.0052)    |
| Cash                   | −0.0313**<br>(0.0117)  | −0.0507***<br>(0.0049) | −0.0021<br>(0.0104)     | 0.0291**<br>(0.0103)   |
| Control for            |                        |                        |                         |                        |
| Year fixed effects     | Yes                    | Yes                    | Yes                     | Yes                    |
| Industry fixed effects | Yes                    | Yes                    | Yes                     | Yes                    |
| State fixed effects    | Yes                    | Yes                    | Yes                     | Yes                    |
| N                      | 15,541                 | 16,202                 | 6,434                   | 11,590                 |
| adj. R <sup>2</sup>    | 0.096                  | 0.148                  | 0.117                   | 0.061                  |

This table presents the robustness check by using alternate measures of RSindex. The dependent variable is cash effective tax rates (Cash ETR), GAAP effective tax rates (GAAP ETR), discretionary book-tax difference (Discretionary BT) and discretionary Permanent Differences (DTAX) in columns 1, 2, 3 and 4, respectively. The key independent variables are RSindex\_0 to RSindex\_4. RSindex\_0 is a dummy variable where RSindex equals 0; RSindex\_1, RSindex\_3 and RSindex\_4 equal 1, 2 and 3, respectively. In the regression, the reference group is RSindex\_2. All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroskedasticity and within-year clustering.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

To sum up, our robustness checks support that there is no evidence of a significant relation between tax avoidance and bank deregulation.

## 5. Subsample tests

As discussed earlier, although the baseline tests show no significant results for *RSindex*, we assume that firms with high financial constraints are more likely to be affected by interstate banking deregulation, because easier access to bank loans after deregulation may relieve their financial constraints and subsequently change their tax avoidance practices. In this section, we examine whether companies' financial constraints moderate the effect of interstate deregulation on tax avoidance behavior.

Table 6  
Robustness test 2.

|                        | (1)<br>Cash ETR        | (2)<br>GAAP ETR        | (3)<br>Discretionary BT | (4)<br>DTAX            |
|------------------------|------------------------|------------------------|-------------------------|------------------------|
| LogRSindex             | 0.0037<br>(0.0059)     | −0.0019<br>(0.0033)    | −0.0024<br>(0.0044)     | −0.0088<br>(0.0121)    |
| ROA                    | −0.2130***<br>(0.0376) | 0.0927***<br>(0.0268)  | 0.0531<br>(0.0363)      | −0.0059<br>(0.0357)    |
| Leverage               | −0.0580***<br>(0.0098) | 0.0536***<br>(0.0050)  | −0.0345***<br>(0.0071)  | 0.0063<br>(0.0153)     |
| Size                   | 0.0159***<br>(0.0008)  | 0.0197***<br>(0.0010)  | 0.0018**<br>(0.0009)    | −0.0084***<br>(0.0019) |
| LagMB                  | −0.0034***<br>(0.0008) | −0.0059***<br>(0.0006) | −0.0006<br>(0.0006)     | 0.0037***<br>(0.0009)  |
| NOL                    | −0.0883***<br>(0.0069) | −0.0478***<br>(0.0028) | 0.0149***<br>(0.0018)   | 0.0315***<br>(0.0050)  |
| Delta_gdwill           | 0.0275***<br>(0.0128)  | 0.0022<br>(0.0144)     | −0.0551***<br>(0.0150)  | −0.0113<br>(0.0337)    |
| New investment         | 0.1034***<br>(0.0142)  | 0.0330***<br>(0.0085)  | −0.1406***<br>(0.0186)  | 0.0232<br>(0.0297)     |
| Foreign assets         | −0.0005<br>(0.0045)    | 0.0102***<br>(0.0028)  | 0.0204***<br>(0.0094)   | −0.0029<br>(0.0051)    |
| Cash                   | −0.0311***<br>(0.0116) | −0.0506***<br>(0.0049) | −0.0020<br>(0.0103)     | 0.0292***<br>(0.0103)  |
| Control for            |                        |                        |                         |                        |
| Year fixed effects     | Yes                    | Yes                    | Yes                     | Yes                    |
| Industry fixed effects | Yes                    | Yes                    | Yes                     | Yes                    |
| State fixed effects    | Yes                    | Yes                    | Yes                     | Yes                    |
| N                      | 15,541                 | 16,202                 | 6434                    | 11,590                 |
| adj. R <sup>2</sup>    | 0.095                  | 0.148                  | 0.117                   | 0.061                  |

This table presents the robustness check by taking natural logarithm of RSindex. The dependent variable is cash effective tax rates (Cash ETR), GAAP effective tax rates (GAAP ETR), discretionary book-tax difference (Discretionary BT) and discretionary permanent differences (DTAX) in columns 1, 2, 3 and 4, respectively. The key independent variable is *logRSindex*, which equals the natural logarithm of  $(1 + \text{RSindex})$ . All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroskedasticity and within-year clustering.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

### 5.1. Financial constraints

If banking competition after interstate deregulation directly affects firms' access to bank loans, it may relax their financial constraints and decrease their tax avoidance practices for cash saving purposes. We use Kaplan and Zingales's (1997) financial constraint index, *KZscore*, and divide the (−3,+3)-year window sample into five subgroups according to the value of *KZscore*. We define firms in the top two quintile groups as highly financially constrained firms and those in the bottom two quintile groups as low financially constrained firms. The regression results for highly financially constrained firms are presented in Table 9, Panel A. The coefficient on *RSindex* is −0.000174 and is not statistically significant when we use *Cash ETR* as the dependent variable. Similar results are found for all other three tax avoidance measures. The results suggest that bank deregulation has no significant effect on tax avoidance practices even for financially constrained firms. In Panel B, we perform regressions for low financially constrained firms, and again the coefficients on *RSindex* are not significant for all tax avoidance measures. There are no significant differences between these two groups. Therefore, we do not find evidence to support the substitutive relation between tax avoidance and the use of debt, even for financially constrained firms.

Table 7  
Robustness test 3.

|                     | (1)<br>Cash ETR        | (2)<br>GAAP ETR        | (3)<br>Discretionary BT | (4)<br>DTAX            |
|---------------------|------------------------|------------------------|-------------------------|------------------------|
| RSindex             | −0.0070<br>(0.0067)    | −0.0003<br>(0.0042)    | −0.0081<br>(0.0065)     | −0.0082<br>(0.0180)    |
| sqrRSindex          | 0.0021<br>(0.0016)     | −0.0001<br>(0.0011)    | 0.0018<br>(0.0014)      | 0.0012<br>(0.0036)     |
| ROA                 | −0.2129**<br>(0.0376)  | 0.0927***<br>(0.0268)  | 0.0534<br>(0.0362)      | −0.0059<br>(0.0357)    |
| Leverage            | −0.0580***<br>(0.0099) | 0.0536***<br>(0.0050)  | −0.0345***<br>(0.0071)  | 0.0063<br>(0.0153)     |
| Size                | 0.0160***<br>(0.0008)  | 0.0197***<br>(0.0010)  | 0.0019**<br>(0.0009)    | −0.0084***<br>(0.0019) |
| LagMB               | −0.0034***<br>(0.0008) | −0.0059***<br>(0.0006) | −0.0006<br>(0.0006)     | 0.0037***<br>(0.0009)  |
| NOL                 | −0.0883***<br>(0.0069) | −0.0478***<br>(0.0028) | 0.0150***<br>(0.0019)   | 0.0315***<br>(0.0050)  |
| Delta_gdwill        | 0.0276**<br>(0.0128)   | 0.0022<br>(0.0143)     | −0.0550***<br>(0.0149)  | −0.0114<br>(0.0338)    |
| New investment      | 0.1030***<br>(0.0141)  | 0.0331***<br>(0.0084)  | −0.1407***<br>(0.0186)  | 0.0231<br>(0.0296)     |
| Foreign assets      | −0.0004<br>(0.0045)    | 0.0102***<br>(0.0028)  | 0.0204**<br>(0.0094)    | −0.0029<br>(0.0051)    |
| Cash_w              | −0.0312**<br>(0.0116)  | −0.0506***<br>(0.0049) | −0.0021<br>(0.0104)     | 0.0292**<br>(0.0103)   |
| N                   | 15,541                 | 16,202                 | 6434                    | 11,590                 |
| adj. R <sup>2</sup> | 0.095                  | 0.148                  | 0.117                   | 0.060                  |

This table presents the robustness check by examining the nonlinear relation between RSindex and tax avoidance. The dependent variable is cash effective tax rates (Cash ETR), GAAP effective tax rates (GAAP ETR), discretionary book-tax difference (Discretionary BT) and discretionary permanent differences (DTAX) in columns 1, 2, 3 and 4, respectively. The key independent variable is *RSindex* and *sqrRSindex*. *sqrRSindex* is equal to the square of *RSindex*. All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroskedasticity and within-year clustering.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

## 5.2. External finance dependence

Our earlier tests show no significant effect of banking deregulation on tax avoidance practices, and thus do not support the use of debt as substitutive of the cash savings from tax avoidance practices. In this subsection, we examine whether companies that are highly dependent on external financing sources substitute cash savings from tax avoidance with the use of debt. We expect that firms that are highly dependent on external finance decrease their tax avoidance, because they have easier access to credit after interstate deregulation. We use the measure of external finance dependence developed by [Duchin et al. \(2010\)](#) and construct a dummy variable, *High\_dependence*, that equals 1 if the value of firm-year external finance dependence (EFD) is above the industry median (indicating higher EFD), and 0 otherwise.

In [Table 10](#), Panel A shows the subsample regression analysis for high EFD firms. The coefficient on *RSindex* is 0.0080 and not statistically significant when we use *Cash ETR* as the dependent variable. Similar results are found for the other three tax avoidance measures. Panel B reports the regression results for low EFD firms. Again, the coefficients on *RSindex* are not statistically significant for all four tax avoidance measures. From these tests, we cannot conclude that these two subgroups are statistically and significantly different from each other. The results indicate that external financing dependence does not moderate the effect of interstate banking deregulation on tax avoidance practices.

Table 8  
Robustness test 4.

|                        | (1)<br>Cash ETR        | (2)<br>GAAP ETR        | (3)<br>Discretionary BT | (4)<br>DTAX           |
|------------------------|------------------------|------------------------|-------------------------|-----------------------|
| BranchRestrict         | 0.0064<br>(0.0519)     | −0.0538**<br>(0.0149)  | −0.0119<br>(0.0193)     | −0.0126<br>(0.0400)   |
| After                  | −0.0092<br>(0.0113)    | −0.0020<br>(0.0027)    | 0.0254**<br>(0.0063)    | −0.0035<br>(0.0054)   |
| Restrict_After         | 0.0069<br>(0.0227)     | 0.0053<br>(0.0039)     | 0.0156<br>(0.0084)      | 0.0181*<br>(0.0072)   |
| ROA                    | −0.2670**<br>(0.0705)  | 0.0440<br>(0.0597)     | 0.1352*<br>(0.0605)     | 0.0998<br>(0.0976)    |
| Leverage               | −0.0774***<br>(0.0144) | 0.0436***<br>(0.0098)  | 0.0008<br>(0.0120)      | 0.0239<br>(0.0138)    |
| Size                   | 0.0133***<br>(0.0023)  | 0.0206***<br>(0.0011)  | −0.0017<br>(0.0022)     | −0.0061**<br>(0.0021) |
| LagMB                  | −0.0016<br>(0.0020)    | −0.0046***<br>(0.0006) | −0.0012<br>(0.0015)     | 0.0032<br>(0.0019)    |
| NOL                    | −0.0705***<br>(0.0119) | −0.0269***<br>(0.0055) | 0.0070<br>(0.0063)      | 0.0327***<br>(0.0061) |
| Delta_gdwill           | 0.0582<br>(0.0394)     | 0.0017<br>(0.0220)     | −0.1223*<br>(0.0527)    | 0.0330<br>(0.0251)    |
| New investment         | 0.0885*<br>(0.0428)    | 0.0040<br>(0.0169)     | −0.1247**<br>(0.0310)   | −0.0557<br>(0.0350)   |
| Foreign assets         | 0.0052<br>(0.0073)     | 0.0155<br>(0.0080)     | 0.0069<br>(0.0142)      | −0.0143<br>(0.0133)   |
| Cash                   | −0.0170<br>(0.0173)    | −0.0494***<br>(0.0114) | −0.0491**<br>(0.0174)   | −0.0348<br>(0.0379)   |
| Control for            |                        |                        |                         |                       |
| Year fixed effects     | Yes                    | Yes                    | Yes                     | Yes                   |
| Industry fixed effects | Yes                    | Yes                    | Yes                     | Yes                   |
| State fixed effects    | Yes                    | Yes                    | Yes                     | Yes                   |
| N                      | 3928                   | 4118                   | 1650                    | 3037                  |
| adj. R <sup>2</sup>    | 0.109                  | 0.151                  | 0.141                   | 0.053                 |

In this regression, we only include states with *RSindex* either equal to 0 (fully open to branching) or 4 (most restrictive to branching). *BranchRestrict* is a dummy variable that equals 1 if the state has four barriers after 1 June 1997, otherwise 0. *After* is a dummy variable that equals 1 if the fiscal year is after 1997. *Restrict\_After* is the interaction term of *BranchRestrict* and *RSindex*. The dependent variable is cash effective tax rates (Cash ETR), GAAP effective tax rates (GAAP ETR), discretionary book-tax difference (Discretionary BT) and discretionary permanent differences (DTAX) in columns 1, 2, 3 and 4, respectively. All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroskedasticity and within-year clustering.

\* Significance level at 10%.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

## 6. Intrastate deregulation

The literature documents different effects imposed by intrastate and interstate deregulations (e.g., Chava et al., 2013). In this section, we perform an additional test on the effect of intrastate deregulation on tax avoidance behavior. We assume that after intrastate deregulation, firms with severe financial constraints may increase their tax avoidance savings, because they may face more restrictive screening technology by banks (Dick and Lehnert, 2010).

We report the regression results in Table 11. Panel A presents the pooled sample regression results, which include all firm-year observations in the pre- and post-intrastate deregulation periods. The coefficients on *Post\_intra* are not statistically significant for all four measures of tax avoidance, suggesting that intrastate deregulation has no significant effect on firms' tax avoidance behavior. Panel B shows the regression results for a (−3,+3)-year window around intrastate deregulation events. Consistent with the pooled sample regres-

sion results, the coefficients on *Post\_intra* are not statistically significant for all tax avoidance measures. In sum, we do find no empirical evidence to support the effect of intrastate deregulation on corporate tax avoidance.

Table 9  
Subsample regressions 1.

|   | (1)<br>Cash ETR          | (2)<br>GAAP ETR           | (3)<br>Discretionary BT  | (4)<br>DTAX            |
|---|--------------------------|---------------------------|--------------------------|------------------------|
| <i>Panel A: Regression for high financially constrained group</i> |                          |                           |                          |                        |
| RSindex   | −0.000174<br>(0.0019)    | 0.000422<br>(0.0017)      | −0.000365<br>(0.0015)    | −0.00696<br>(0.0077)   |
| KZindex   | −0.00000669*<br>(0.0000) | −0.0000103***<br>(0.0000) | −0.000000550<br>(0.0000) | 0.00000473<br>(0.0000) |
| ROA   | −0.236***<br>(0.0338)    | −0.00348<br>(0.0292)      | 0.0359<br>(0.0452)       | −0.0399<br>(0.0469)    |
| Leverage  | −0.0292*<br>(0.0152)     | 0.0574***<br>(0.0085)     | −0.0219<br>(0.0140)      | 0.00439<br>(0.0354)    |
| Size  | 0.0157***<br>(0.0040)    | 0.0124***<br>(0.0032)     | 0.00813***<br>(0.0024)   | −0.00872<br>(0.0104)   |
| LagMB   | −0.00185<br>(0.0011)     | −0.00210**<br>(0.0008)    | −0.000949<br>(0.0006)    | 0.00107<br>(0.0014)    |
| NOL   | −0.0405***<br>(0.0094)   | −0.00169<br>(0.0058)      | 0.00662**<br>(0.0026)    | 0.00761<br>(0.0079)    |
| Delta_gdwill  | 0.0491**<br>(0.0182)     | 0.00732<br>(0.0117)       | −0.0964***<br>(0.0307)   | −0.0315<br>(0.0547)    |
| New investment  | 0.0192<br>(0.0210)       | −0.00161<br>(0.0202)      | −0.129***<br>(0.0204)    | 0.106<br>(0.0729)      |
| Foreign assets  | −0.00483<br>(0.0061)     | 0.00735*<br>(0.0038)      | −0.0139<br>(0.0277)      | 0.00288<br>(0.0137)    |
| Cash  | −0.0258<br>(0.0241)      | −0.0211*<br>(0.0116)      | −0.0154<br>(0.0175)      | 0.0103<br>(0.0219)     |
| N   | 5447                     | 5527                      | 3514                     | 4511                   |
| adj. R <sup>2</sup>   | 0.097                    | 0.109                     | 0.179                    | 0.085                  |
| <i>Panel B: Regression for low financially constrained group</i>  |                          |                           |                          |                        |
| RSindex   | 0.00784*<br>(0.0043)     | −0.000302<br>(0.0024)     | 0.00142<br>(0.0047)      | −0.000642<br>(0.0037)  |
| KZindex   | −0.000902***<br>(0.0003) | −0.0000565<br>(0.0002)    | −0.00106*<br>(0.0006)    | 0.000116<br>(0.0003)   |
| ROA   | −0.180***<br>(0.0482)    | 0.146***<br>(0.0275)      | 0.133**<br>(0.0570)      | 0.0662<br>(0.0486)     |
| Leverage  | −0.0539*<br>(0.0208)     | 0.0357***<br>(0.0097)     | −0.0237<br>(0.0304)      | 0.0167<br>(0.0138)     |
| Size  | 0.0525***<br>(0.0047)    | 0.0367***<br>(0.0032)     | 0.00491<br>(0.0078)      | −0.0194***<br>(0.0045) |
| LagMB   | −0.00591***<br>(0.0015)  | −0.00888***<br>(0.0011)   | −0.000850<br>(0.0019)    | 0.00680***<br>(0.0021) |
| NOL   | −0.120***<br>(0.0074)    | −0.0788***<br>(0.0049)    | 0.0217***<br>(0.0083)    | 0.0487***<br>(0.0085)  |
| Delta_gdwill  | 0.00628<br>(0.0140)      | −0.0115<br>(0.0289)       | −0.0790*<br>(0.0414)     | −0.0170<br>(0.0726)    |
| New investment  | 0.0953***<br>(0.0170)    | 0.0370***<br>(0.0162)     | −0.0684*<br>(0.0365)     | 0.00817<br>(0.0519)    |
| Foreign assets  | 0.00702<br>(0.0089)      | 0.0176***<br>(0.0035)     | 0.0407<br>(0.0246)       | −0.00999<br>(0.0099)   |
| Cash  | −0.0574***<br>(0.0136)   | −0.0833***<br>(0.0114)    | 0.0230<br>(0.0224)       | 0.0456**<br>(0.0182)   |

(continued on next page)



Table 9 (continued)

|                            | (1)<br>Cash ETR | (2)<br>GAAP ETR | (3)<br>Discretionary BT | (4)<br>DTAX |
|----------------------------|-----------------|-----------------|-------------------------|-------------|
| <i>N</i>                   | 6201            | 6674            | 1290                    | 4232        |
| adj. <i>R</i> <sup>2</sup> | 0.121           | 0.184           | 0.111                   | 0.059       |

This table presents the regression results of the baseline model using subsample tests. We follow Kaplan and Zingales's (1997) financial constraints index (*KZindex*). We divide the (−3,+3) window sample into high- and low- financially constrained groups, and perform the baseline model regression separately. The dependent variable is cash effective tax rates (*Cash ETR*), GAAP effective tax rates (*GAAP ETR*), discretionary book-tax difference (*Discretionary BT*) and discretionary permanent differences (*DTAX*) in columns 1, 2, 3 and 4, respectively. The key independent variable is *RSindex*, ranging from 0 to 4. All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroskedasticity and within-year clustering.

\* Significance level at 10%.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

Table 10  
Subsample regressions 2.

|   | (1)<br>Cash ETR        | (2)<br>GAAP ETR        | (3)<br>Discretionary BT | (4)<br>DTAX            |
|---|------------------------|------------------------|-------------------------|------------------------|
| <i>Panel A: Regression for high EFD group</i> |                        |                        |                         |                        |
| <i>RSindex</i>                                | 0.0080<br>(0.0060)     | 0.0014<br>(0.0034)     | 0.0002<br>(0.0040)      | −0.0000<br>(0.0028)    |
| <i>ROA</i>                                    | −0.5272***<br>(0.0776) | 0.0088<br>(0.0497)     | 0.2207*<br>(0.1119)     | 0.0040<br>(0.0468)     |
| <i>Leverage</i>                               | −0.0930***<br>(0.0236) | 0.0423**<br>(0.0190)   | −0.0128<br>(0.0250)     | 0.0220<br>(0.0130)     |
| <i>Size</i>                                   | 0.0119***<br>(0.0033)  | 0.0190***<br>(0.0019)  | −0.0007<br>(0.0047)     | −0.0070**<br>(0.0029)  |
| <i>LagMB</i>                                  | 0.0032*<br>(0.0017)    | −0.0045***<br>(0.0010) | −0.0029<br>(0.0038)     | 0.0058<br>(0.0036)     |
| <i>NOL</i>                                    | −0.0858***<br>(0.0133) | −0.0368***<br>(0.0065) | 0.0129<br>(0.0114)      | 0.0290***<br>(0.0080)  |
| <i>Delta_gdwill</i>                           | 0.0716***<br>(0.0273)  | −0.0015<br>(0.0150)    | −0.2181***<br>(0.0843)  | 0.0157<br>(0.0122)     |
| <i>New investment</i>                         | 0.0527<br>(0.0461)     | 0.0337<br>(0.0269)     | −0.0976<br>(0.0846)     | −0.0197<br>(0.0609)    |
| <i>Foreign assets</i>                         | 0.0064<br>(0.0085)     | 0.0201***<br>(0.0066)  | −0.0137<br>(0.0221)     | 0.0054<br>(0.0073)     |
| <i>Cash</i>                                   | −0.0516***<br>(0.0209) | −0.0525***<br>(0.0131) | 0.0722<br>(0.0455)      | −0.0028<br>(0.0248)    |
| <i>N</i>                                      | 3087                   | 3250                   | 874                     | 2155                   |
| adj. <i>R</i> <sup>2</sup>                    | 0.137                  | 0.119                  | 0.163                   | 0.031                  |
| <i>Panel B: Regression for low EFD group</i>  |                        |                        |                         |                        |
| <i>RSindex</i>                                | 0.0006<br>(0.0022)     | 0.0003<br>(0.0014)     | −0.0029<br>(0.0023)     | −0.0051<br>(0.0055)    |
| <i>ROA</i>                                    | −0.1099***<br>(0.0373) | 0.1055***<br>(0.0274)  | 0.0217<br>(0.0498)      | −0.0308<br>(0.0393)    |
| <i>Leverage</i>                               | −0.0545***<br>(0.0125) | 0.0464***<br>(0.0076)  | −0.0488***<br>(0.0102)  | 0.0011<br>(0.0251)     |
| <i>Size</i>                                   | 0.0178***<br>(0.0011)  | 0.0203***<br>(0.0011)  | 0.0010<br>(0.0014)      | −0.0092***<br>(0.0023) |
| <i>LagMB</i>                                  | −0.0050***<br>(0.0008) | −0.0059***<br>(0.0008) | 0.0000<br>(0.0006)      | 0.0038***<br>(0.0009)  |
| <i>NOL</i>                                    | −0.0885***<br>(0.0059) | −0.0483***<br>(0.0039) | 0.0181***<br>(0.0032)   | 0.0316***<br>(0.0059)  |

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Table 10 (continued)

|                            | (1)<br>Cash ETR       | (2)<br>GAAP ETR        | (3)<br>Discretionary BT | (4)<br>DTAX          |
|----------------------------|-----------------------|------------------------|-------------------------|----------------------|
| Delta_gdwill               | 0.0082<br>(0.0162)    | 0.0072<br>(0.0134)     | −0.0355**<br>(0.0146)   | −0.0331<br>(0.0493)  |
| New investment             | 0.1333***<br>(0.0218) | 0.0327<br>(0.0203)     | −0.1846***<br>(0.0189)  | 0.0547<br>(0.0415)   |
| Foreign assets             | −0.0016<br>(0.0065)   | 0.0088**<br>(0.0031)   | 0.0326***<br>(0.0089)   | −0.0043<br>(0.0081)  |
| Cash                       | −0.0364**<br>(0.0144) | −0.0440***<br>(0.0074) | −0.0104<br>(0.0076)     | 0.0409**<br>(0.0182) |
| <i>N</i>                   | 10,009                | 11,770                 | 3792                    | 7296                 |
| adj. <i>R</i> <sup>2</sup> | 0.096                 | 0.156                  | 0.115                   | 0.084                |

This table presents the regression results of the baseline model using subsample tests. We follow Duchin et al.'s (2010) external finance dependence (EFD) measure. If the firm-year EFD is 3-digits below the SIC median EFD, it is considered less dependent on external finance. We divide the (−3,+3) window sample into high- and low- EFD groups, and perform the baseline model regression separately. The dependent variable is cash effective tax rates (Cash ETR), GAAP effective tax rates (GAAP ETR), discretionary book-tax difference (Discretionary BT) and discretionary permanent differences (DTAX) in columns 1, 2, 3 and 4, respectively. The key independent variable is RSindex, ranging from 0 to 4. All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroskedasticity and within-year clustering.

\* Significance level at 10%.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

Table 11  
Intrastate deregulation regressions.

|  | (1)<br>Cash ETR_       | (2)<br>GAAP ETR        | (3)<br>Discretionary BT | (4)<br>DTAX           |
|--|------------------------|------------------------|-------------------------|-----------------------|
| <i>Panel A: Full sample regression</i> |                        |                        |                         |                       |
| Post_intra                             | 0.0159<br>(0.0167)     | −0.0133<br>(0.0101)    | 0.0050<br>(0.0060)      | 0.0105<br>(0.0240)    |
| ROA                                    | −0.4744***<br>(0.0291) | 0.0038<br>(0.0201)     | 0.0691***<br>(0.0128)   | 0.0248<br>(0.0558)    |
| Leverage                               | −0.0699***<br>(0.0135) | 0.0596***<br>(0.0093)  | −0.0444***<br>(0.0058)  | −0.0396<br>(0.0256)   |
| Size                                   | 0.0067***<br>(0.0012)  | 0.0064***<br>(0.0008)  | 0.0022***<br>(0.0005)   | −0.0042*<br>(0.0022)  |
| LagMB                                  | −0.0010<br>(0.0007)    | −0.0032***<br>(0.0005) | 0.0001<br>(0.0003)      | 0.0054***<br>(0.0014) |
| NOL                                    | −0.0508***<br>(0.0046) | −0.0177***<br>(0.0033) | 0.0102***<br>(0.0020)   | 0.0138<br>(0.0090)    |
| Delta_gdwill                           | 0.0734***<br>(0.0215)  | 0.0432***<br>(0.0152)  | −0.0036<br>(0.0093)     | −0.0515<br>(0.0395)   |
| New investment                         | 0.0248<br>(0.0257)     | −0.0628***<br>(0.0178) | −0.1493***<br>(0.0110)  | 0.0620<br>(0.0491)    |
| Foreign assets                         | −0.0146<br>(0.0160)    | −0.0034<br>(0.0108)    | −0.0013<br>(0.0071)     | −0.0341<br>(0.0282)   |
| Cash                                   | −0.0574***<br>(0.0131) | −0.0707***<br>(0.0090) | 0.0260***<br>(0.0058)   | 0.0357<br>(0.0263)    |
| Control for                            |                        |                        |                         |                       |
| Year fixed effects                     | Yes                    | Yes                    | Yes                     | Yes                   |
| Industry fixed effects                 | Yes                    | Yes                    | Yes                     | Yes                   |
| State fixed effects                    | Yes                    | Yes                    | Yes                     | Yes                   |
| <i>N</i>                               | 10,909                 | 11,462                 | 13,540                  | 8738                  |
| adj. <i>R</i> <sup>2</sup>             | 0.085                  | 0.082                  | 0.103                   | 0.109                 |

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Table 11 (continued)

|  | (1)<br>Cash ETR <sub>it</sub> | (2)<br>GAAP ETR <sub>it</sub> | (3)<br>Discretionary BT <sub>it</sub> | (4)<br>DTAX <sub>it</sub> |
|--|-------------------------------|-------------------------------|---------------------------------------|---------------------------|
| <i>Panel B: (−3,+3) window sample regression</i> |                               |                               |                                       |                           |
| Post_intra                                       | 0.0191<br>(0.0215)            | 0.0041<br>(0.0143)            | 0.0124<br>(0.0160)                    | 0.0081<br>(0.0073)        |
| ROA  | −0.3571***<br>(0.0593)        | 0.0850*<br>(0.0482)           | 0.1629<br>(0.2724)                    | 0.0434<br>(0.0443)        |
| Leverage   | −0.0565<br>(0.0372)           | 0.0534*<br>(0.0304)           | −0.0976**<br>(0.0289)                 | −0.0001<br>(0.0094)       |
| Size   | 0.0191***<br>(0.0016)         | 0.0080***<br>(0.0025)         | 0.0062**<br>(0.0023)                  | −0.0032*<br>(0.0016)      |
| LagMB  | −0.0012<br>(0.0016)           | −0.0051***<br>(0.0016)        | −0.0057<br>(0.0049)                   | 0.0014<br>(0.0011)        |
| NOL  | −0.1385**<br>(0.0097)         | −0.0531***<br>(0.0153)        | 0.0195**<br>(0.0066)                  | 0.0146***<br>(0.0041)     |
| Delta_gdwill                                     | 0.1837***<br>(0.0333)         | 0.0248<br>(0.0253)            | −0.0659<br>(0.0671)                   | −0.0171<br>(0.0111)       |
| New investment                                   | 0.0369<br>(0.0340)            | −0.0208<br>(0.0305)           | −0.2074***<br>(0.0694)                | 0.0153<br>(0.0284)        |
| Foreign assets                                   | 0.0090<br>(0.0141)            | 0.0415***<br>(0.0054)         | −0.0210<br>(0.0477)                   | −0.0070*<br>(0.0036)      |
| Cash   | 0.0339<br>(0.0270)            | −0.0453***<br>(0.0126)        | 0.0465<br>(0.0432)                    | 0.0112<br>(0.0189)        |
| Control for                                      |                               |                               |                                       |                           |
| Year fixed effects                               | Yes                           | Yes                           | Yes                                   | Yes                       |
| Industry fixed effects                           | Yes                           | Yes                           | Yes                                   | Yes                       |
| State fixed effects                              | Yes                           | Yes                           | Yes                                   | Yes                       |
| N  | 2043                          | 2457                          | 1004                                  | 2143                      |
| adj. R <sup>2</sup>                              | 0.157                         | 0.156                         | 0.114                                 | 0.018                     |

This table presents the regression results for intrastate deregulation. The key independent variable is *Post\_intra*, a dummy variable that equals 1 when the fiscal year is after the state's intrastate deregulation event. All variables are defined in the Appendix. For brevity, we omit the subscripts in the table. Panel A shows the results for the intrastate deregulation tests including all firm-year observations. Panel B reports the results for intrastate deregulation tests including firm-year observation within a (−3,+3) year window around intrastate deregulation events. Standard errors are in parentheses. We use OLS regressions, and adjust standard errors for heteroscedasticity and within-year clustering.

\* Significance level at 10%.

\*\* Significance level at 5%.

\*\*\* Significance level at 1%.

## 7. Conclusion

This paper examines the substitutive relation between tax avoidance practices and the use of debt. We use interstate banking deregulations as external shocks to the supply and the price of credit. In states that are more open toward branching, firms are more likely to enjoy lower loan costs and easier access to credit. If the substitutive relation holds, those firms in open states should make more use of debt and consequently engage in less tax avoidance. However, we do not find empirical evidence to support this hypothesis. Further, we find that firms do not significantly change their tax avoidance behavior when they relax their financial constraints. This study contributes to the current debate on whether a substitutive relation exists between tax avoidance savings and the use of external financing. This paper also helps to understand the real effect of banking deregulation on the real economy.

Although we do not observe a significant effect of bank deregulation on corporate tax avoidance, we are cautious in drawing the conclusion that there is no substitutive relation between corporate tax avoidance and the use of debt. It is possible that such an effect may indeed exist, but we are simply unable to find it empirically due to some limitations and caveats in our study. First, our four measures of tax avoidance in gen-

eral capture the overall level of tax avoidance practices. It is possible that there is a substitutive relation between the use of debt and certain types of tax avoidance strategies, which are not directly measured in our study. Second, [Graham and Tucker \(2006\)](#) find a substitutive relation between the usage of debt and more aggressive tax avoidance such as tax sheltering, while our four measures capture more broad tax avoidance. Third, another potential explanation for our main results is that tax avoidance behavior is permanent or not reversible. When firms are facing financial constraints or are unable to meet their capital demand, they might exploit unused tax planning strategies and save cash for their capital demand. However, whether they reverse their tax avoidance strategies when their financial constraints relax is unknown. If tax avoidance strategies are permanent or irreversible, it is not surprising that we do not observe a significant change after banking deregulation. Fourth, although our research design is based on interstate banking deregulation as an external shock, our results could still be biased by some firm-level or region-level omitted variables.

## Appendix A. Variable definitions

| Variable         | Definition   |
|------------------|--|
| RSindex          | Rice-Strahan index of inter-state banking deregulation based on <a href="#">Rice and Strahan (2010)</a> . It ranges from 0 (deregulated) to 4 (highly regulated) based on a state's regulation changes |
| CETR             | The cash effective tax rate for the year, defined as total income taxes paid (TXPD) scaled by the total of pre-tax income (PI) minus minority interest (MII)   |
| GAAP ETR         | The GAAP effective tax rate for the year defined as total income-tax expenses (TXT) scaled by pre-tax income (PI)  |
| Discretionary BT | Discretionary BT builds on the BT measure proposed by Manzon and Plesko (2002)   |
| DTAX             | Modified discretionary permanent differences and ETR differentials as defined in <a href="#">Frank et al. (2009)</a>   |
| <i>Controls</i>  |  |
| Lag M/B          | Market capitalization (CSHO*PRCC_F) over the book value of total shareholders' equity (AT-LT) at the beginning of the year   |
| Delta_gdwill     | The annual change in good will if greater than 0; otherwise 0  |
| ROA              | Net income(or loss) (NI) scaled by beginning of the year total assets (AT)   |
| Leverage         | Long-term debt (LT) over total assets (AT)   |
| Size             | Natural logarithm of the market value of equity (PRCC_F 3 CSHO) for firms at the beginning of year   |
| NOL              | A dummy variable that equals 1 if the loss carried forward (TLCF) for the firm is positive at the beginning of the year  |
| Cash             | Cash holding for firm i, year t, defined as cash and marketable securities (CHE) divided by lagged assets (AT)   |
| Foreign assets   | Foreign income (PIFO) for firm i, year t, scaled by lagged assets (AT). Missing values in PIFO are set to 0  |

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