Monitoring from Capital Market and Corporate Tax Avoidance: Evidence from Short Selling Pilot Program[1]

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Abstract: Capital market provides monitoring and disciplines firms, but how it impacts firms' corporate tax avoidance is controversial. In this paper, we investigate how monitoring from capital market affects tax avoidance level using the Rule 202T pilot program of Regulation SHO as a natural experiment. We examine the impacts of short sale constraints removal on tax avoidance by difference-in-differences regressions. We find that firms reduce tax avoidance behaviors after the removal of short sale constraints, because short sellers monitor firm and increase the probability of tax avoidance being caught. This effect is more pronounced in firms more dependent on equity financing. These findings suggest that monitoring stemming from capital market makes firms "steal" less from the government.

Key Words: Monitoring from Capital Market, Tax Avoidance, Short Selling.

1. Introduction

Corporate tax is an important income resource for state revenues. In fiscal year 2016, corporate income tax contributed $444 billion to U.S. Treasury, constituted about a fifth of total federal tax receipts.[2] Although paying tax is a basic social responsibility for firms, to minimize tax payment and keep more free cash flows, many firms use various methods, both legally and illegally, to evade tax payment, and the fact that firms pay little income tax arouses many attentions. During 2008 to 2012,

[2] Source: What America's Biggest Companies pay in Taxes. Available at: https://www.forbes.com/sites/christopherhelman/2017/04/18/what-americas-biggest-companies-pay-in-taxes/#5e87318d2f51 (access date: 2018/07/05)

288 corporations in the Fortune 500 paid an effective federal income tax rate of just 19.4%, while the statutory tax rate was 35%.[3] Tax evasion does not only happen in poor-performing firms, profitable public firms also pay very little income taxes. For example, Facebook only paid $273 million in 2016 while it reported $6.2 billion in pretax income.[4] Many other giant companies, like Google, Apple and so on, also have been accused of tax avoidance.[5] While tax avoidance saves money for firms, it has negative influence on social welfare. The cost of tax avoidance transactions (e.g. Chetty, 2009), the risk imposed on risk-averse tax evaders (Yitzhaki, 1987), the distorting competition between tax-honest and tax-evading firms (Strand, 2005), the damages to trade frequency and quality (Balafoutas et al., 2015) derived by tax evasion all cause welfare losses. The opacity of tax avoidance transactions also provide an ideal cover for managerial diversions, so it may also damage the shareholder wealth. Therefore, how to prevent tax avoidance is an important question not only for the government, but also for the investors and even the whole society.

Many studies also investigates the determinants of tax avoidance, they find that factors such as tax policies (Hoopes, 2012), corporate governance (Desai and Dharmapala, 2006; Armstrong et al., 2015), potential reputation damage (Graham, Li and Qiu, 2008; Chen et al., 2010), can affect firms' tax avoidance level.[6] However,

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[3] Source: The Sorry State of Corporate Taxes, Citizen for Tax Justice. Available at https://www.ctj.org/the-sorry-state-of-corporate-taxes/. (access date: 2018/07/05)

[4] Source: How Much do Public Companies Pay in Income Taxes? Forbes. Available at https://www.forbes.com/sites/peterjreilly/2016/10/20/how-much-do-public-companies-pay-in-income-taxes/2/#34dede5c6fba . (access date: 2018/07/05)

[5] See " 7 Corporate Giants Accused of Evading Billions in Taxes". Available at http://fortune.com/2016/03/11/apple-google-taxes-eu/. (access date: 2018/07/05)

[6] There are other factors can affect tax avoidance: Phillips (2003) finds that compensating business-unit managers on an after-tax basis leads to lower effective tax rates. McGuire, Wang and Wilson (2011) study the relation between dual class ownership and tax avoidance, and they find that dual class managers tend to avoid risky tax planning. Beck, Lin and Ma (2014) find that better credit

little research considered the relation between capital market and tax avoidance.

Stiglitz (1985) argues that income taxes can be completely arbitraged away in a perfect capital market and with astute tax payers. However, in the real world, the capital market is imperfect, and the tax payers are troubled with agency problems, so how capital market interacts with tax avoidance is hard to say. No short-sale constraints is one of the most important assumption of perfect capital market, so the impact of short selling on tax avoidance arouses our interest.

Short selling is also an important but controversial capital market activity. Despite many people think that the short selling is dangerous to the stability of financial markets, many studies show the bright sides of short selling. Short selling can contribute to price discovery processes (Miller, 1977; Boehmer and Wu,2013), and make the market more efficient (Saffi and Sigurdsson, 2011), thus provides monitoring and discipline firms. Previous studies find that short selling curbs earnings management (Massa, Zhang and Zhang, 2015a; Fang, Huang and Karpoff, 2016), helps detect corporate frauds (Karpoff and Lou, 2010; Fang, Huang and Karpoff, 2016), reduces the managers' myopic behaviors, and promotes innovation (He and Tian, 2014).

However, the impact of short selling on tax avoidance is disputed. Above all, short sellers can provide effective monitoring to the firm. Short sellers are good at digging and analyzing firm information, especially negative information, thus make

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information systems and higher branch penetration are associated with less tax evasion. Firms in close customer-supplier relationships are better able to implement tax avoidance (Cen et al., 2016). Chernykh and Mityakov (2017) find that offshore-banking helps in tax evasion. Other documented factors which may affect firms' tax avoidance behaviors include cultural norms (Debacker, Heim and Tran, 2015), labor union (Chyz, Leung, Li and Rui, 2013).

firms' bad news more likely to be discovered (Karpoff and Lou, 2010; Christophe, Ferri and Angel, 2004; Christophe, Ferri and Hsieh, 2010) and those bad news can also be reflected on firms' stock prices in a faster speed (e.g. Miller, 1977; Diamond and Verrecchia, 1987; Bris, Goetzmann and Zhu, 2007; Berber and Pagano, 2013). These effects further influence managers' decision making process and affect tax avoidance.

On one hand, due to the external monitoring effects stemming from short selling pressures, the negative news are more likely to be discovered and spread after the short sale constraints are removed. Tax avoidance is a risky investment (Slemrod, 2004; Armstrong et al., 2015), firms that undertake tax avoidance are punished severely if caught, but can save a lot of money if they are not. Tax avoidance is also been considered as a negative conduct by the government and investors, revealing tax avoidance can trigger price drop, thus benefits short sellers. Therefore, after firms' short-sale constraint removes, the probability of getting caught increases, the cost of tax avoidance increases, especially for firms having high level of tax avoidance, they are more likely to be involved with illegal tax fraud, thus are more likely to be the targets of short sale. Thereby, when short selling pressures increase, managers tend to be more cautious and cut down tax avoidance. We refer to this mechanism as the "risk-taking channel".

On the other hand, short selling pressures may improve firms' corporate governance by prompting external monitoring (Massa, Zhang and Zhang, 2013). Desai and Dharmapala (2006) show that because managers tend to use the same

transactions to conduct managerial diversion and tax avoidance, after corporate governance improves, such transactions are more difficult to process, and thereby firms' tax avoidance level will decrease. We refer to this mechanism as the "corporate governance channel".

Both the risk-taking channel and the corporate governance channel indicate short selling induces decreases in tax avoidance behaviors. Nevertheless, another mechanism also exists, which may result in a positive relation between short selling and tax avoidance. Because of short selling pressures, firms need to perform better to sustain high stock prices in case they are shorted. Therefore, firm managers have incentives to avoid high tax payments, ensure more free cash flows are available for firms to invest, leading to long-term growth and higher stock prices.

The unclear theoretical predictions of the impacts of short selling pressures on tax avoidance leave out an empirical question. Using the Rule 202T pilot program of Regulation SHO as a natural experiment, we conduct the Difference-in-Differences (DID) estimation to investigate the relation between short selling and tax avoidance. In July 2004, the SEC launched Regulation SHO to stipulate short selling deals in the US stock market. Regulation SHO contains the Rule 202T pilot program, which suspends short sale price tests for pilot stocks. Before the program, short selling could happen only when the stock prices meet the criteria of short sale price tests (NYSE Rule 440B and Nasdaq Rule 3350). The pilot program ranked the Russell 3000 index by trading volume in each stock exchange and chose every third stock as a pilot stock. These pilot stocks were exempted from short sale price tests during May 2005 to July

2007. After that, the SEC eliminated short sale price tests for all listed stocks.

The pilot program provides a natural experiment to help identify the causal impacts on tax avoidance for several reasons, since the pilot firms and non-pilot firms are very comparable, and only pilot stocks' short sale constraint was removed during the experiment period while the non-pilot stocks remained the same. Using the DID estimation, we find that pilot firms tend to be less tax avoidant during the program.

We further examine the specific channel on how short selling pressures reduce firms' tax avoidance behaviors. First, we test the risk-taking channel. If risk-taking channel stands, the impact of short selling should be more prevalent in firms with high levels of tax avoidance, because those firms are riskier and more likely to be the targets of short sale. We estimate the quantile regressions and find that this effect is more prevalent in firms with a high level of tax avoidance, which is consistent with the risk-taking channel. Second, we test the corporate governance channel. If corporate governance channel stands, the impacts of short selling should be more prevalent in firms with worse corporate governance. We use four corporate governance proxies: product market threat, E index, analyst coverage and institutional ownership, and divide the full sample into two subsamples respectively. We find the effect of short selling is more pronounced in firms facing fiercer product market threat, and the effect is similar no matter what the E index, analyst coverage and institutional ownership are. All these results are not consistent with the corporate governance channel.

The impact of short selling may be affected by equity financing dependence.

More equity-financing-dependent firms are more sensitive to stock price changes, and they are more likely to be the target of short sellers, so the impact of short selling on tax avoidance should be more pronounced in those firms. We divide the full sample in to two subsamples using KZ index of fiscal year 2004, and rerun the main regressions. We find that the impact of short selling is more prevalent in firms with high KZ index, suggesting the tax avoidance level of firms that are more reliant on equity finance are more affected by short selling.

Finally, we do several robustness checks. We perform pre-trend analysis to test the parallel assumption and to address the compounding effects, the pre-trend analysis shows that the main results are driven by pilot program and the parallel assumption holds. We also conduct placebo tests using pseudo pilot firms, the placebo tests shows if we randomly draw pseudo pilot firms, the coefficients of key independent variable are very close to zero, thereby our main results are not driven by random effects. We also try several alternative tax avoidance measures and change the sample periods, the main results still holds.

Our findings suggest that short selling reduces tax avoidance by providing monitoring and disciplining firm managers, this effect is stronger for firms more dependent on equity financing.

This paper contributes the literature in the following ways. First, our paper contributes to the tax avoidance literature. Although there are many studies about tax avoidance, little research links tax avoidance to the capital market. This research begins to fill this blank. Second, although short selling has been widely studied and

many researchers point out short selling can change firm behaviors, to the best of our knowledge, no research links short selling to public finance. Government is an important firm stakeholder, but how short selling affects government interest remains mysterious. This study sheds light on this mystery.

The rest of the paper is organized as follows: in section 2, we develop testing hypotheses; in section 3, we introduce the institutional background and empirical methods used in the paper; in section 4, we discuss the variables, data and sample construction; in section 5, we present the empirical findings; in section 6, we conduct robustness checks; and in section 7, we draw conclusions.

2. Hypothesis Development

Previous studies (e.g., Miller, 1977; Boehme, Danielsen and Sorescu, 2006; Berkman et al., 2008; Bartling and Park, 2010; Boehmer and Wu, 2013) find that short selling plays a positive role in price discovery processes. First, Short sellers are good at collecting and analyzing information (Engelberg, Reed and Ringgenberg, 2012), they also have motives to short the firms' stocks and make the firms' stock prices crash if they detect firms' misconduct (e.g. Karpoff and Lou,2010; Cohen, Diether and Malloy, 2007; Hirshleifer, Teoh and Yu,2011). Second, they also improve the stock market efficiency, short sellers induce insiders to sell more and trade faster (Massa et al., 2015b), thus increasing market efficiency (Saffi and Sigurdsson, 2011). Scheinkman and Xiong (2003) and Hong and Stein (2003) find that short sale constraint makes it harder for stock prices to reflect negative information and causes overpricing, since negative private information is sensitive to short selling. Therefore,

the existence of short sellers on the stock market imposes pressures on shareholders and managers, and induce firm managers make correct M&A decisions (Chang, Lin and Ma, 2015), impede earnings management (Massa, Zhang and Zhang, 2015a；Fang, Huang and Karpoff, 2016), and facilitate innovation by reducing managers' myopic behaviors (He and Tian, 2016). These short selling pressures may affect the tax avoidance behaviors.

Short selling may reduce firms' tax avoidance through the two channels: the risk-taking channel and the corporate governance channel.

Through the risk-taking channel, managers tend to be more conservative when they make decisions because of short selling pressures. Tax avoidance is a kind of risky behavior (Armstrong et al., 2015), it increases firms' after-tax profits and firm value for shareholders (Wilson, 2009), but it also brings many potential damages. Besides the penalties imposed by the government if tax evasion is found out (Allingham and Sandmo, 1972), there are also other costs, for example, the potential reputation damage (Graham, Li and Qiu, 2008; Chen et al, 2010), higher credit spread when obtaining bank loans (Hasan et al., 2014) and higher stock price crash risk (Kim, Li and Zhang, 2011; Hanlon and Slemrod, 2009). When short sell constraints are relaxed, short sellers are more motivated to dig firms' tax avoidance, and make the tax avoidance more likely to be found out, thereby increasing the expectation of cost of tax avoidance. Anticipating the probability of getting tax penalties increases after removing short sale constraints but the benefit will stay the same, managers will be more conservative and undertake less tax sheltering.

Through the corporate governance channel, short sellers would monitor firms when short-sale constraints are removed, managers would be less prone to diverting under the supervision of short sellers, thus corporate governance is improved. However, many studies find that tax avoidance is more severe when agency problem exists. Since after-tax free cash flow is a source of diversion for managers, those in firms with good corporate governance may have less incentive to evade tax payments (Desai and Dharmapala, 2006; Balakrishnan, Blouin and Guay, 2012). Moreover, improved corporate governance causes the transactions which can make both managerial diversion and tax avoidance decrease, resulting in a negative relation between corporate governance and tax avoidance (Desai and Dharmapala, 2006). Specifically, since tax saving is normally the source of private benefits of control, managers will have less incentive to save tax when their firms have good corporate governance and they are less likely to derive private benefits of control. As a result, short-selling pressures may be associated with less tax aggressiveness due to the externality of corporate governance improvement.

Both risk-taking channel and corporate governance channel suggest that larger short selling is associated with lower level of tax avoidance, thereby we propose the following hypothesis:

Hypothesis A: Short selling pressures reduce firms' tax avoidance behaviors.

Short-selling pressures may also increase firms' tax avoidance. Short selling pressures amplify the dissatisfying performance of the firms (Scheinkman and Xiong, 2003; Hong and Stein, 2003; Karpoff and Lou, 2010; Hobbs, Keasler and Mcneil,

2012). Tax avoidance can save firms' tax payments, thereby increases their free cash flows. With the cash flow savings, firms can invest, pursue long-term growth, and keep their competitive advantages in the product market (Cai and Liu, 2009), leading to higher stock prices in the market. To cater to investors' expectations, firms may increase their cash flows by tax avoidance. Based on this argument, we propose the following hypothesis:

Hypothesis B: Short selling pressures increase firms' tax avoidance behaviors.

3. Institutional Background and Research Design

3.1. Regulation SHO and the Pilot Program of Rule 202T

The Securities and Exchange Commission (SEC) adopted the Regulation SHO to govern short sales on June 23, 2004. This new regulation contains a pilot program, Rule 202T, which suspends pilot stocks from short-sale price tests. Before the pilot program, short selling prices were restricted by the Rule 10a-1 of the Exchange Act and NASD Rule 3350.[7] Under Rule 10a-1, also known as the "tick test," a security can only be shorted at a price above the most recently traded price (also called a "plus test") or at the most recently traded price when it is higher than the last different price (also called the "zero-plus test"). Rule 10a-1 only governs the securities trading in exchanges, but similar rules exist for OTC markets. In the Nasdaq National Market System, Rule 3350 prohibits short sales at or below the current best (inside) bid when that bid is lower than the previous best (inside) bid (also called a "bid test"). These short-sale price tests aim to avoid bear raids, but they also constrain short selling.

[7] More details in https://www.sec.gov/rules/concept/34-42037.htm#P54_11589 (access date: June, 2018)

The pilot program of Rule 202T of Regulation SHO began on May 2, 2005 and ended on July 6, 2007. The pilot stocks were selected from Russell 3000 index components June 25, 2004. The SEC excluded the securities not listed on the Nasdaq National Market, Amex, NYSE or IPO after April 30, 2004, then sorted the remaining securities into three groups: Amex, Nasdaq National Market, and NYSE. Then it ranked those securities in each group by average daily trading volume over the year before July, 2004. Every third stock of each group was selected as pilot stock.[8] The pilot stocks were suspended from any short-sale price tests during the program, therefore short selling constraints for those pilot stocks were removed.

After the program, the SEC eliminated short-sale price tests for all listed stocks. However, the elimination of short-sale price tests aroused many doubts and objections. The SEC issued a modified rule in February, 2010, stipulating that price tests would be triggered when the stock prices drop by 10% or more from the previous day's closing prices.

We use this program as a natural experiment to investigate the relation between short selling pressures and tax avoidance. This pilot program provides an ideal background to conduct DID tests for two reasons. First, since the pilot program of Rule 202T only removes the short-sale price tests for the pilot stocks, during this program, investors can short the pilot stocks at very low prices while they can only short the non-pilot stocks above the minimum requirement stipulated by price tests. Therefore the short selling pressures of pilot firms increased during the program while

[8] More details and the list of pilot stock can be found at https://www.sec.gov/rules/other/34-50104.htm#P30_3288 (access date: June 2018)

those of non-pilot firms kept the same. Second, because the selection process of pilot stocks doesn't have any favors to certain types of firms, the pilot firms and non-pilot firms are comparable, makes the assumption of the DID estimation valid.

3.2. Empirical Strategy

We adopt a difference-in-differences (DID) model to estimate the impact of short selling pressures on tax avoidance. The specification is as follows:

$$TAX\_AV_{i,t} = \alpha_0 + \beta_0 * During_t * Treat_i + \beta_1 * Post_t * Treat_i + \theta * X_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

where $TAX\_AV_{i,t}$ is our proxy of firm i's tax avoidance level in year t. $During_t$ is an indicator for the pilot program period, which equals 1 if firm i's fiscal year falls in the pilot program, 0 otherwise. To be specific, for firms whose fiscal year ends before May, $During_t$ is 1 if fyear is 2005, 2006 and 2007; for firms whose fiscal year ends after June, $During_t$ is 1 if fyear is 2006 and 2007; 0 otherwise. $Post_t$ is an indicator for the period after the program, which equals 1 if fiscal year is larger than or equals 2008, 0 otherwise. $Treat_i$ is an indicator for pilot firm, which equals 1 if the firm i's stock is a pilot stock, 0 otherwise. $X_{i,t}$ is the vector of time-varying control variables, α_i is the firm fixed effects, γ_t is the year fixed effects, and $\varepsilon_{i,t}$ is the error term. We use robust standard errors to address heteroscedasticity and autocorrelation issues. Here the interaction term $During_t * Treat_i$ is of interest. If β_0 is significantly negative, Hypothesis A is supported; if β_0 is significantly positive, Hypothesis B is supported.

4. Data

4.1 Variables

4.1.1 Tax Avoidance Variables (TAX_AV)

In the main empirical analysis, we use four tax avoidance measures: book-tax difference (*BTD*), tax sheltering residual (*TS*), permanent book-tax difference (*PERMD*) and three-year GAAP effective tax rate (*GETR3*). Higher *BTD*, *TS* and *PERMD* means higher level of tax avoidance; Higher *GETR3* means higher effective tax rate, that is lower level of tax avoidance.

First, we follow Desai and Dharmapala (2006) and construct book-tax difference (*BTD*) as tax avoidance measure. *BTD* is calculated as pre-tax income (*PI* in Compustat) minus estimated taxable income, and divided by one-year lagged total asset. The estimated taxable income equals federal income tax expense (*TXFED* in Compustat) divided by federal income tax rate[9], which is 35% in the sample period.

However, tax avoidance literature (e.g. Desai and Dharmapala, 2009) suggests earnings management attributes to *BTD*, and short selling also reduces earnings management (e.g., Fang, Huang and Karpoff, 2016). In order to rule out the impacts of earnings management, similar to Desai and Dharmapala (2009) we use total accrual to isolate the component of *BTD* due to tax avoidance. We run Model (2) and get the coefficient of total accrual (*TAR*), then compute tax sheltering residual (*TS*) using Formula (3). The regression results of Model (2) is in Appendix B.

$$BTD_{i,t} = \alpha_0 + \beta * TAR_{i,t} + \alpha_i + \varepsilon_{i,t} \quad (2)$$

$$TS_{i,t} = BTD_{i,t} - \hat{\beta} * TAR_{i,t} \quad (3)$$

Here *i* denotes firm i, *t* denotes fiscal year t. *TAR* is the scaled total accruals, calculated as change in current assets, minus change in current liabilities, minus

[9] Some studies use the sum of federal income tax expense (*TXFED*) and foreign income tax expense(*TXFO*) divided by the lagged total asset as the estimated taxable income. Our results won't be affected if we use this estimate.

change in cash, plus change in short-term debt, minus depreciation and amortization expense, then divided by total assets at the beginning of the fiscal year. α_i is the firm fixed effects.

The third tax avoidance measure is permanent book-tax difference (*PERMD*). Since temporary book-tax difference reflects earnings management via pre-tax accruals, we construct the permanent book-tax difference (*PERMD*) following Frank, Lynch and Rego (2009) and Kim et al. (2011), which equals total book-tax difference and temporary book-tax difference. Here total book-tax difference equals the sum of federal income tax and foreign income tax rate, divided by income tax rate (35%), then subtracted by pre-tax income, finally divided by one-year lagged total asset. The temporary book-tax difference equals the deferred income tax divided by income tax rate (35%), divided by one-year lagged total asset.

The fourth tax avoidance is three-year GAAP effective tax rate (*GETR3*). It is calculated as the sum of total income tax expense from t-2 to t, divided by the sum of pre-tax income from t-2 to t. GAAP effective tax rate is widely used in tax avoidance literature (e.g. Cen et al., 2017). However, short-term effective tax rate measures are distorted when pre-tax income is negative, and the tax expense includes both current and deferred income taxes, it could not reflect tax avoidance deals such as deferring income for tax purposes. Dyreng, Hanlon and Maydew (2008) suggest that long run effective tax rate can eliminate such problems. In addition, Armstrong et al. (2015) also use three-year GAAP effective tax rate. Therefore, we use three-year GAAP effective tax rate. We choose three years instead of more commonly used five or ten

years is because the program only last for three years.

We also try many alternative measures in the robustness checks. Following Balakrishnan, Blouin and Guay (2012) and Armstrong et al. (2015), we also adopt industry-and-size adjusted *BTD* (*BTD_adj*), *TS* (*TS_adj*), *PERMD(PERMD_adj)* and *GETR3* (*GETR3_adj*) as robustness checks to measure tax avoidance. *BTD_adj* (*TS_adj, PERMD_adj, GETR3_adj*) is the difference between the firm's *BTD* (*TS, PERMD, GETR3*) and the average *BTD* (*TS, PERMD, GETR3*) of the firms with similar size in the same industry (i.e., firms in the same quarter of total assets in the same two-digit SIC industry).

We also use industry-year regressions to re-estimate tax shielding residuals and get another tax shielding residuals measure (*TS2*). We regress *BTD* on *TAR* using samples of every two-digit SIC industry in each year, and take the regression residuals as *TS2*. We exclude the samples with observations less than 10.

We also try other two effective tax rate measures. The first one is current effective tax rate (*CurrentETR*), which equals current income tax divided by pre-tax income. We truncate *CurrentETR* at 0 and 1. The second one is three-year cash effective tax rate (*CETR3*), which equals the sum of income tax paid from t-2 to t, divided by the sum of pre-tax income (exclude special pre-tax income) from t-2 to t.

4.1.2 Pilot Program Variables

First, we define a dummy variable, *Treat*, to identify pilot firms and non-pilot firms. If a firm's stock is a pilot stock, then *Treat* is 1; if it's a non-pilot stock, then *Treat* is 0.

Then we define a dummy variable, *During*, to identify the pilot program period. If a firm's fiscal year is in the program *During* is 1, otherwise it's 0. To be specific, for firms whose fiscal year ends before May, $During_t$ is 1 if fyear is 2005, 2006 and 2007; for firms whose fiscal year ends after June, $During_t$ is 1 if fyear is 2006 and 2007[10]; 0 otherwise. Here we use the beginning of fiscal year instead the end of the fiscal year because many transactions to avoid taxes are complicated and requires a lot of time.

4.1.3 Control Variables

Following Fang, Huang and Karpoff (2016), we control the interaction term of after-program dummy (*Post*) and pilot firm dummy (*Treat*). *Post* is 1 if an observation's fiscal year equals or is larger than 2008, 0 otherwise. As we mentioned earlier, the price-tests of all stocks are eliminated after the program. Therefore, in theory, we should expect the coefficient of *Post*Treat* have an opposite sign with *During* Treat*. However, Fang et al. (2016) also point out that there may be a lasting effect of the pilot program, and it takes time to plan tax shielding strategies, so the sign of *Post*Treat* may also be the same as *During* Treat.*

We control for the following firm characteristics: Firm Size (*Size*), market-to-book ratio (*MB*), fix asset ratio (*PPE*), intangible asset ratio (*Intang*), net profit margin (*NPM*), sales growth (*Salegr*), if the firm suffers operating loss (*Loss*), if the firm has foreign income (*FI_dummy*), leverage (*Lev*), depreciation and amortization (*DP*), and operating cash flow (*CFO*).

[10] We don't include fiscal year 2005 since for firms whose fiscal year ends after June, their fiscal year 2005 begins before the program.

Size is calculated as the natural logarithm of total assets, we control it because firm size is related to tax avoidance and it's a widely controlled in related research (e.g. Rego, 2003, Plesko, 2003; Wilson, 2009; Dyreng, Hanlon and Maydew, 2010). *MB* is calculated as market value of firm equity divided by book value of common equity. *NPM* is calculated as net income divided by total assets. *Salegr* is the change of sales divided by sales in the last fiscal year. These three variables are controlled because firm performance is related to tax payment (Robinson, Sikes and Weaver, 2010). *PPE* is fixed asset value divided by total assets. *Intang* is intangible assets divided by total assets. We control these variables because the depreciation of fixed assets and intangible assets is commonly used to manipulate taxable income. *Lev* is calculated as total liability divided by total assets. *DP* is calculated as depreciation and amortization divided by total assets. We control leverage because debt can serve as a tax shield (Ang, Cole and Lin, 2000; Jensen and Meckling, 1976), depreciation and amortization also serve the same purpose. *CFO* is operating cash flow divided by total assets. We control it because cash flows can affect firms' ability to pay taxes. The definitions of variables are reported in Appendix A.

4.2 Sample Construction

We use the component stocks of Russell 3000 Index in June 2004 as our sample. We drop the firms in the finance industry (SIC from 6000 to 6999) and the utility industry (SIC from 4900 to 4999). We also exclude unreasonable observations with leverage higher than 1 or lower than 0.

We also rule out non-U.S. firms since other countries may have different tax rates

and tax systems. The sample period is 2000-2012. We choose a relatively long period because tax avoidance behaviors often take long time to plan and execute. We also use different sample periods in robustness checks. After the data clearing process, we have 1,773 firms with 19,819 observations, in which 579 are pilot firms. All continuous variables are winsorized at 1% and 99%.

The list of Russell 3000 Index components is provided by FTSE Russell. The accounting data is taken from Compustat. Product market fluidity data is from Hoberg-Philips Data Library.[11] Analyst following information comes from I/B/E/S. Institutional ownership data is taken from Thomson Reuters 13f files. E index data is taken from ISS (formerly RiskMetric).

4.3. Summary Statistics

Table 1 displays the summary statistics of the variables we use in this paper. The mean value of *Treat* is 0.333, suggesting that one-third of our sample are the pilot firms. The mean value of *During* is 0.162, suggesting 16.2% of the full sample is in the pilot program period. Average *GETR3* is 0.229, suggesting in this sample, the effective tax rate is 22.9%.

[Insert Table 1 Here]

Table 2 shows the comparison between the pilot firms and non-pilot firms in fiscal year 2004. We use t-test and Wilcoxon rank-sum test to see if the mean and median values of the two group of firms have significant difference. From Table 2, we can see that the pilot firms and non-pilot firms don't have significant difference. This

[11] Data is available at http://hobergphillips.tuck.dartmouth.edu/.

result suggests that pilot firms and non-pilot firms are very similar before the program starts.

[Insert Table 2 Here]

4.4 Preliminary Analysis

We draw the time trend of average tax avoidance levels of pilot firms and non-pilot firms in Figure 1. Subgraph (a) shows the mean value of *BTD* of the two groups of firms during 2004 to 2008. As we can see from the graph, the average *BTD* suffered a larger decrease for pilot firms than for non-pilot firms. This pattern also shows when using *TS* as the measure of tax avoidance (Subgraph b). Subgraph (c) shows the average *PERMD* of the two groups. The average *PERMD* of pilot firms decreased during the program, while that if non-pilot firms kept increasing. Subgraph (d) shows the average *GETR3* of the two groups. As we can see from the graph, the average *GETR3* for pilot firms increased more than non-pilot firms. All of these results suggest that the tax avoidance level would decrease after the removal of short-sale constraints.

[Insert Figure 1 Here]

5. Results

5.1. Main Results

The estimation results of Model (1) are reported in Table 3. When the dependent variables are *BTD*, *TS* and *PERMD* respectively, the coefficients of *During*Treat* are all -0.009 and significant at 5% in both regressions, which indicates a firm conducts less tax avoidance after short-sale price tests are removed. The coefficients of

*Post*Treat* is negative may due to the program has a lasting effect (Fang et al., 2016). When the dependent variable is *GETR3*, the coefficient of *During*Treat* is 0.041 and significant at 1%, suggesting the 3-year effective tax rate on average increases 4.1% after the removal of short-sale price tests. The economic magnitude is also significant. All these results indicate that short selling pressures are associated with lower level of tax avoidance, which is consistent with Hypothesis A.

For the control variables, firm size has negative impacts on tax avoidance, it is consistent with previous studies (e.g. Cen et al., 2018). Perhaps it is because that regulators pay more attention on large firms. *NPM* and *SaleGrowth* are positively associated with tax avoidance, perhaps because more profitable firms have stronger incentive to conduct tax avoidance. *Loss* is negatively related to *BTD*, *TS* and *PERMD*, it is mechanical since *Loss* is negatively related with pre-tax income, and pre-tax income is positively related with these variables. *Loss* is negatively related to *GETR3* since firms can use operating loss carrybacks and carryforwards to reduce tax payment. Foreign tax havens are commonly used in tax shielding, therefore *FI_dummy* is positively related to tax avoidance. Firms with high leverage or high depreciation and amortization pay less taxes, so they have less incentives to avoid tax, thus lead to negative relations of leverage, depreciation and amortization and tax avoidance. Higher operating cash flow is associated with more tax avoidance, it may be because tax avoidance can save cash.

[Insert Table 3 Here]

5.2 Examining the Impact Channels

We show that short-selling pressures can reduce firms' tax avoidance behaviors, however, there are two possible explanations. One is the risk taking channel, and the other is the corporate governance channel. A natural question arises: which channel is the real mechanism? To answer this question, we run the following tests.

5.2.1 The Risk Taking Channel

Tax avoidance is not totally bad for firms, tax planning in an appropriate and legal way is both safe and beneficial to firms. However, high level of tax avoidance is an indicator of risky tax evasion and possible tax fraud, so firms with high level of tax avoidance are more likely to be targets of short sellers. Therefore, if the risk-taking channel stands, the effect of short selling on tax avoidance will be more pronounced at high levels of tax avoidance.

To test the risk-taking channel, following Armstrong et al. (2015) we use the quartile regression to estimate Model (1) to exploit the heterogeneous effects of short selling pressures on different levels of tax avoidance. Via quartile regression, we can estimate the impacts of the independent variables on different quartiles of dependent variables. The results are presented in Table 4.

[Insert Table 4 Here]

To be succinct, we show the results only of odd deciles. The coefficient of *During*Treat* is -0.015 for the 9th deciles but insignificant for the 1st deciles when the dependent variable is *BTD*; it is -0.009 for the 9th deciles but insignificant for the 1st deciles when the dependent variable is *TS*; it is -0.007 for the 9th deciles but 0.001 for the 1st deciles when the dependent variable is *PERMD*; it is 0.053 for the 1th deciles

but -0.000 for the 9st deciles when the dependent variable is *GERT3*. The coefficient is more significant in high level of tax avoidance, and it shows an increasing trend with the tax avoidance level. These results are consistent with the risk-taking channel.

5.2.2 The Corporate Governance Channel

If short-selling pressures reduce tax avoidance through the corporate governance channel, its effect will be more pronounced in firms with weak governance. Therefore, we use several corporate governance proxies, namely product market threat, E index, analyst coverage and institutional ownership, and we divide the full sample into two subsamples according to these proxies in 2004. If the corporate governance channel stands, we should expect the impacts of short selling is more pronounced in firms with better corporate governance.

First, we use product market threat as the proxy of corporate governance. Product market competition gives the firm managers pressure and push them to adopt better corporate governance (e.g. Giroud and Mueller, 2011), so firms facing larger product market threat tend to have better governance. If the corporate governance channel stands, then firms in noncompetitive product market will be more affected by short selling. To test this, we use the product market fluidity (*Fluidity*) developed by Hoberg, Phillips and Prabhala (2014) as the measure of product market threat, it measures the change in a firm's product space due to moves made by competitors in a firm's product market.[12] Higher fluidity means higher product market threat. We

[12] Hoberg et al. (2014) get all the unique words used in the product descriptions of all firms in year t, and construct an ordered boolean vector $W_{i,t}$ to identify the words used by firm i in year t. In $W_{i,t}$, Element j equals 1 if firm i uses word j in its product description, 0 otherwise. To calculate the change of product market, they use $D_{t-1,t}=|\sum_j (W_{i,t} - W_{i,t-1})|$. They also normalize $W_{i,t}$ to unit length and define the result as $N_{i.t}$. Fluidity is the dot product of $N_{i,t}$ and normalized $D_{t-1,t}$.

divided the firms into high-fluidity group and low-fluidity group according to firms' fluidity in fiscal year 2004. If a firm has a higher fluidity than the median, it belongs to the high-fluidity group, otherwise it belongs to the low-fluidity group. We run the main regressions using the two subsamples, the results are reported in Table 5. The coefficients of *During*Treat* are -0.015 (significant at 5%), -0.015(significant at 5%), -0.004 and 0.077(significant at 1%) in the high-fluidity group, but they are -0.001, -0.001, 0.001 and 0.031 in the low-fluidity group and all of them are insignificant. These results in some degree suggest impacts of short selling are more prevalent in firms facing fiercer competition, which is contradictory to the prediction of the corporate governance channel.

[Insert Table 5 Here]

The second proxy of corporate governance is the entrenchment index (E index) developed by Bebchuk, Cohen and Ferrell (2009), a higher E index means the firm managers are more entrenched, which is an indicator for weak corporate governance (Bebchuk, Cohen and Ferrell, 2009).[13] We divided the firms into high-E index group and low-E index group according to firms' E index in fiscal year 2004. If a firm has a higher E index than the median in fiscal year 2004, it belongs to the high-E index group, otherwise it belongs to the low-E index group. The results are reported in Table 6. The estimates of *During*Treat* are very close in the two groups. These results also cannot support the corporate governance channel.

[Insert Table 6 Here]

[13] E index is based on six provisions: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes and supermajority requirements for mergers and charter amendments. For each provision, if the firm adopt it, then E index increases by 1 score, 0 otherwise.

The third proxy is analyst coverage. Analysts are also considered as effective monitors of firms, thus firms with more analyst coverage should have better corporate governance. We divided the firms into high-analyst-coverage group and low-analyst-coverage group according to firms' analyst coverage in fiscal year 2004. If a firm has more analysts following than the median in fiscal year 2004, it belongs to the high-analyst-coverage group, otherwise it belongs to the low-analyst-coverage group. The results are reported in Table 7. The estimates of *During*Treat* are also very close in the two groups. These results also cannot support the corporate governance channel.

[Insert Table 7 Here]

The last proxy is institutional ownership. Previous studies (e.g. Hartzell and Starks, 2001) find that institutional investors can efficiently monitor firms, hence firms with higher institutional ownership tend to have better corporate governance. As what we did before, we divided the firms into high-institutional-ownership group and low- institutional-ownership group according to firms' institutional ownership in fiscal year 2004. If a firm has more institutional ownership than the median in fiscal year 2004, it belongs to the high-institutional ownership group, otherwise it belongs to the low-institutional ownership group. The results are reported in Table 8. The estimates of *During*Treat* are also very close in the two groups, which is not consistent with the corporate governance channel.

[Insert Table 8 Here]

5.3 Equity Financing Dependence

The impact of short-selling pressures on tax avoidance may be influenced by firms' dependence on equity financing. Massa, Zhang and Zhang (2013) point out that the impact of short-selling pressures on corporate governance is larger in firms that are more dependent on equity financing. Grullon, Michenaud and Weston (2015) also find that small firms also reduce equity issues to adapt to the falling price caused by short selling. Short sellers bring downward pressures on stock prices. Lower stock price induces firms dependent on equity financing need to issue more shares when they are using equity financing, further increasing their financing costs. Hence, firms that are more dependent on equity financing are more sensitive to the downward pressures on stock prices, and they are also more sensitive to short-selling pressures. In addition, firms more dependent on equity financing may also have larger bankruptcy risk, therefore they may get more attention from short sellers. Thus, the impact of short selling on tax avoidance is more pronounced in those firms.

To test this hypothesis, we follow Baker, Stein and Wurgler (2003) and Massa et al. (2013), and use the KZ index to measure equity financing dependence. The KZ index is a measure of financial constraint developed by Kaplan and Zingales (1997). It is calculated using Model (4). The higher the KZ index means more financially constrained a firm is, thus more difficult to get loans and more reliant on equity financing.

$$KZ\_Index = -1.002*(CF_{i,t}/PPE_{i,t-1}) - 39.368*(DIV_{i,t}/PPE_{i,t-1}) - 1.315*(CashEnd_{i,t} / PPE_{i,t-1}) + 3.129*Lev_{i,t} + 0.283* TobinQ_{i,t} \quad (4)$$

Here $CF_{i,t}$ is firm i's cash flow, calculated as the sum of firm i's net profits and

depreciation and amortization in year t. $DIV_{i,t}$ is the dividend paid by firm i in year t. $CashEnd_{i,t}$ is firm i's cash and short-term investment, $TobinQ_{i,t}$ is firm i's Tobin's Q value, $Lev_{i,t}$ is leverage, $PPE_{i,t-1}$ is firm i's fixed assets in year t-1.

We divide the full sample into two subsamples using the KZ index. If a firm has a higher KZ index than the median cash holding in fiscal year 2004, it belongs to the high-KZ index group, otherwise it belongs to the low-KZ index group.

Using these subsamples, we rerun the main regressions. The results are presented in Table 9. The coefficient of *During*Treat* is negative and significant in the high-KZ index group, but it's insignificant in the more-cash group and low-KZ group. The magnitude of the coefficient is also larger in the high-KZ index group. These results suggest the effect of short selling pressures is more prevalent in firms that are more dependent on equity financing.

[Insert Table 7 Here]

6. Robustness Check

6.1 Pre-trend Analysis

Besides the Regulation SHO, other events may have occurred around the pilot program, so that our results might be driven by these confounding effects. Following Bertrand and Mullainathan (2003), we conduct the pre-trend analysis to eliminate the concern of these confounding effects.

We construct five dummies and replace *During* with them in Model (1), then run the regressions again using the full sample. The four dummies are: (1) *Year2003*: it equals 1 in fiscal year 2003, 0 otherwise; (2) *Year2004*: it equals 1 in fiscal year 2004,

0 otherwise; (3) *Year2005*: it equals 1 in fiscal year 2005, 0 otherwise; (4) *Year2006&2007*: it equals 1 in fiscal year 2006 or 2007, 0 otherwise.

[Insert Table 10 here]

Table 10 displays the results. The coefficients of *Year2003* and *Year2004* are insignificant in both regressions, which means that before the program, the tax avoidance levels of the affected and control group are similarly trending, supporting the parallel trend assumption. These results suggest that the parallel assumption of DID estimation holds.

Year2005 is also insignificant, maybe because 2005 is the beginning of the program, the effect of the program had not shown at that time. The coefficient of *Year2006&2007* is significantly negative when the dependent variables are *BTD*, *TS* and *PERMD*; it is positive when the dependent variable is *GETR3*. These results suggest the firms' tax avoidance decreases only after the program's initiation. The decrease of tax avoidance is due to the pilot program, not other confounding events.

6.2 Placebo Test

To further confirm the results are due to the pilot program, we randomly draw 579 firms out of entire 1,773 firms in year 2004 as pseudo pilot firms and construct a pseudo program. We define a dummy variable, *Treat_Pseudo*, which equals 1 if the firm is a pseudo pilot firm, 0 otherwise. Then we use *Treat_Pseudo* to replace *Treat* in Model (1) and rerun the main regressions. We repeat the process for 500 times, the distribution of estimate of *During*Treat_Pseudo* and its t statistic are reported in Table 11, the average estimate of *During*Treat_Pseudo* is very close to zero, and the

t statics are very small in most regressions. These results suggest that the main results are not driven by chance.

[Insert Table 11 Here]

6.3 Alternative Measures of Tax Avoidance

Besides the four main tax avoidance measures, we also try alternative measures to ensure the robustness of our results.

First, following Armstrong et al. (2015), we also use industry-and-size adjusted tax avoidance measures as dependent variables. For firm i, we calculate the average tax avoidance of its industry and size peers (i.e. those firms in the same quartile of total asset and in the same two-digit SIC industry with firm i). Then we subtract the size-and-industry average tax avoidance level from the original tax avoidance measures, and get four size-industry-adjusted tax avoidance measures: *BTD_adj*, *TS_adj*, *PERMD_adj* and *GETR3_adj*. We re-estimate Model (1) using those four size-industry-adjusted tax avoidance measures, the results are reported in Column (1) to (4) Table 12. The coefficient of *During*Treat* is similar with the main results, suggesting the main result is robust to alternative measures of tax avoidance.

[Insert Table 12 Here]

Second, some may doubt the estimate of tax shielding residual in Model (2) and (3) may not fully capture the impact of total accrual on *BTD*. In order to further address the impact of earnings management, we use another tax shielding residual, *TS2*. We regress *BTD* on total accrual (*TAR*) in each two-digit SIC industry and fiscal year, and keep the residual as *TS2*. Here we exclude the industry-year with

observations less than 10. Using *TS2* as the dependent variable, we re-estimate Model (1) and display the result in Column (5) of Table 12. *During*Treat* is still significantly negative.

We also use the current effective tax rate as an alternative measure of tax avoidance. The current effective tax rate equals current income tax divided by pre-tax income. Deferred tax may affect our results, for example, if the firm has deferred tax payment before the program and paid it during the program, then the impact of short selling on tax avoidance will be over-estimated. To eliminate the impact of deferred tax, we use current income tax instead of total income tax, and construct the current effective tax rate (*CurrentETR*). We drop the observations with negative *CurrentETR* or *CurrentETR* larger than 1. The regression result of using *CurrentETR* as tax avoidance measure is displayed in Column (6) in Table 12. *During*Treat* is significantly positive, which further confirms our main results.

Finally, we use three-year cash effective tax rate (*CETR3*) as the measure of tax avoidance. It is calculated as the sum of income tax paid from t-2 to t, divided by the sum of pre-tax income (exclude special pre-tax income) from t-2 to t. The result of using *CETR3* as tax avoidance measure is reported in Column (7) of Table 12. The coefficient of *Post*Treat* is significantly negative, indicating the tax avoidance level of non-pilot firms decreases after the removal of price tests of non-pilot firms. This results is also consistent with Hypothesis A.

6.4 Changing the Sample Period

We also use different sample periods to run Model (1). First, since 2005 is the

beginning year of the pilot program, we exclude the observations in year 2005 and rerun the main regressions. The results are reported in Panel A of Table 13. The coefficient of *During*Treat* is consistent with the main results. Similarly, since the pilot program ended in July 2007, we exclude the observations in year 2007 and rerun the main regressions. The results are reported in Panel B of Table 11. The coefficient of *During*Treat* is still similar to the main results. Next, we exclude the observations after the program ends, in other words, *Post* equals 0, then rerun the main regressions. The results are reported in Panel C of Table 13. The main results still hold. Finally, since SEC stipulated the new price tests after February 2010, we use the sample of 2000 to 2009 and re-estimated Model (1), the results are reported in Panel D of Table 13. The main results still holds even after we exclude the observations after 2010.

[Insert Table 13 Here]

7 Conclusion

In this paper, we investigate the impact of short-selling pressures on firms' tax avoidance. Using the pilot program of Regulation SHO's Rule 202T as a natural experiment, we conduct DID estimation to examine the impact of short-selling pressures on firms' tax avoidance behaviors. We find that during the pilot program, the decline in tax avoidance for pilot firms is larger than for non-pilot firms; if the short-sale constraints are removed, firms will undertake less tax avoidance. Further analyses suggest that this because short sellers provide effective monitoring and increase the probability of tax avoidance being caught, thereby reducing tax avoidance. Firms that are more dependent on equity financing are more affected by

short selling.

Our findings contribute to the recognition of the link between capital market and firm tax avoidance. Our results show that short sellers can monitor firms and help reduce firms' tax avoidance levels. Our findings suggest that capital market plays an important role in firms' taxation and social responsibility, the invisible hand of capital market contributes to tax enforcement. Our findings also provide a new perspective to understand the economic consequences of short selling, short sellers play active roles in monitoring and disciplining firm managers. Reasonable and appropriate loosening of short sale constraints can be beneficial to firm stakeholders.

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Table 1 Summary Statistics

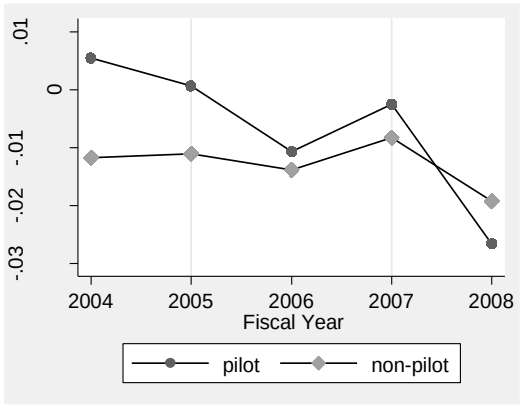
This table displays summary statistics of our main variables.

Variables	Observations	Mean	S. D.	P25	Median	P75
Treat	19819	0.333	0.471	0	0	1
BTD	15343	-0.017	0.189	-0.014	0.024	0.060
TS	14875	-0.017	0.192	-0.013	0.026	0.062
PERMD	14677	-0.034	0.184	-0.008	0.007	0.024
GETR3	19462	0.229	0.421	0.072	0.321	0.378
During	19819	0.162	0.368	0	0	0
Post	19819	0.314	0.464	0	0	1
Size	19817	6.809	1.695	5.647	6.691	7.858
MB	19446	3.021	4.141	1.413	2.251	3.702
PPE	19745	0.485	0.366	0.194	0.383	0.703
Intang	19113	0.180	0.187	0.021	0.118	0.288
NPM	19674	-0.241	1.492	-0.005	0.043	0.091
SaleGrowth	19520	0.153	0.414	-0.008	0.084	0.207
Loss	19819	0.256	0.436	0	0	1
FI_dummy	19819	0.531	0.499	0	1	1
Lev	19747	0.487	0.256	0.295	0.477	0.634
DP	19795	0.044	0.030	0.025	0.038	0.055
CFO	19802	0.072	0.146	0.041	0.093	0.144

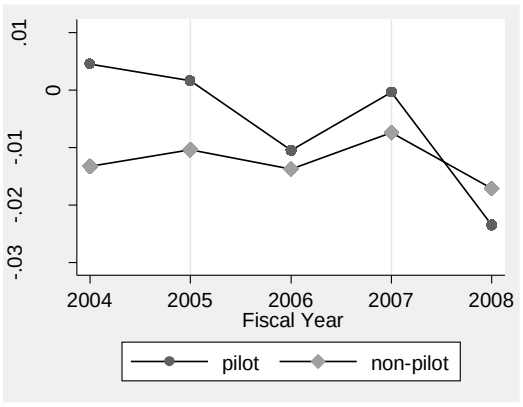
Table 2 Main Firm Characteristics in Fiscal Year 2004.

This table compares the mean and median values of firm characteristics between pilot firms and non-pilot firms. Here we only use the observations without any variables missing. Column (1) and (3) show the mean value of firm characteristics for pilot firms and non-pilot firms, respectively. Column (2) and (4) show the median value of firm characteristics for pilot firms and non-pilot firms, respectively. We conduct t tests to test the difference between the mean values of pilot firms and non-pilot firms, t-statistics are reported in Column (5). We conduct Wilcoxon rank-sum tests to test the difference between the median values of pilot firms and non-pilot firms, z-statistics are reported in Column (6). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

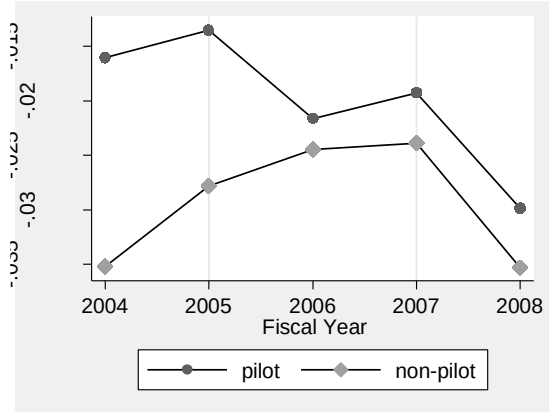
Variables	Pilot Firms		Non Pilot Firms		Difference	
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean	Med	Mean	Med	t-test	Wilcoxon
BTD	0.015	0.034	-0.001	0.033	1.567	0.379
TS	0.015	0.034	-0.002	0.034	1.582	0.396
PERMD	-0.010	0.010	-0.025	0.009	1.513	1.044
GETR3	0.240	0.323	0.235	0.324	0.223	-0.865
Size	6.716	6.613	6.646	6.476	0.742	0.723
MB	3.680	2.640	3.579	2.835	0.422	-0.359
PPE	0.450	0.367	0.461	0.353	-0.530	-0.361
Intang	0.177	0.122	0.182	0.127	-0.419	-0.203
NPM	-0.257	0.056	-0.302	0.053	0.448	1.205
SaleGrowth	0.244	0.153	0.218	0.146	1.137	0.969
Loss	0.144	0	0.180	0	-1.643	-1.642
FI_dummy	0.506	1	0.491	0	0.515	0.515
Lev	0.439	0.449	0.450	0.436	-0.827	-0.651
DP	0.039	0.035	0.042	0.035	-1.468	-0.647
CFO	0.086	0.100	0.076	0.097	1.226	0.925



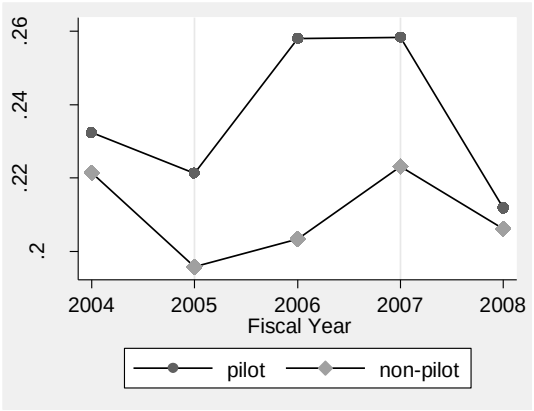
a. Mean Value of *BTD*



b. Mean Value of *TS*



c. Mean Value of *PERMD*



d. Mean Value of *GETR3*

Figure 1. Mean Value of Tax Avoidance Measures During 2004-2008.

This graph shows the mean value of *BTD* (subgraph a), *TS* (subgraph b), *PERMD* (subgraph c) and *GETR3* (subgraph d) in pilot firms and non-pilot firms. The black dot stands for pilot firms, the gray curb stands for non-pilot firms.

Table 3. Short Selling and Tax Avoidance.

This table shows the regression of Model (1). The dependent variable in Column (1) is *BTD, TS* in Column (2), *PERMD* in Column (3) and *GETR3* in Column (4). *During*Treat* is our key variable. The definition of variables is reported in Appendix A. We control firm fixed effect and year fixed effect in both regressions. The robust t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.009**	-0.009**	-0.009**	0.041***
	(-2.462)	(-2.387)	(-2.131)	(2.647)
*Post*Treat*	-0.005	-0.006*	-0.001	-0.000
	(-1.563)	(-1.698)	(-0.151)	(-0.014)
Size	-0.008**	-0.009**	-0.004	0.048***
	(-2.210)	(-2.427)	(-1.033)	(4.961)
MB	0.000	0.000	0.000	-0.000
	(0.667)	(0.571)	(1.101)	(-0.295)
PPE	-0.006	-0.005	-0.013	0.013
	(-0.434)	(-0.347)	(-0.911)	(0.371)
Intang	-0.010	-0.001	-0.020	0.034
	(-0.730)	(-0.097)	(-1.296)	(0.725)
NPM	0.036***	0.036***	0.038***	-0.002
	(14.246)	(13.976)	(14.695)	(-0.885)
SaleGrowth	-0.033***	-0.035***	-0.032***	0.006
	(-5.938)	(-6.215)	(-5.560)	(0.823)
Loss	-0.146***	-0.144***	-0.119***	-0.051***
	(-35.989)	(-34.842)	(-25.345)	(-3.317)
FI_Dummy	0.012***	0.013***	0.008*	-0.010
	(3.118)	(3.374)	(1.880)	(-0.725)
Lev	-0.033***	-0.027**	-0.038***	-0.010
	(-2.876)	(-2.311)	(-3.111)	(-0.411)
DP	-0.858***	-0.797***	-0.685***	-0.196
	(-7.953)	(-7.290)	(-5.752)	(-0.849)
CFO	0.305***	0.312***	0.298***	-0.007
	(13.852)	(13.770)	(12.506)	(-0.175)
Constant	0.081***	0.078***	0.037	-0.029
	(3.127)	(2.925)	(1.316)	(-0.412)
Observations	14,346	13,926	13,712	18,386
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Adj-R squared	0.738	0.737	0.683	0.156

Table 4. Tests for the Risk taking channel (Quantile regression).

This table displays the quantile regression results of Model (1). The dependent variable in Panel A is *BTD*, *TS* in Panel B, *PERMD* in Panel C and *GETR3* in Panel D. The robust t value is reported in the parentheses. Variables' definitions are provided in Appendix A. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Using *BTD* as tax avoidance measure					
	(1)	(2)	(3)	(4)	(5)
			Quantile		
Variables	0.1	0.3	0.5	0.7	0.9
*During*Treat*	-0.002	-0.002	-0.007	-0.005***	-0.015***
	(-1.069)	(-0.699)	(-1.596)	(-7.449)	(-14.697)
*Post*Treat*	-0.005***	0.003	0.004**	0.005	-0.007***
	(-3.383)	(0.856)	(2.403)	(0.882)	(-6.140)
Observations	14,346	14,346	14,346	14,346	14,346
Controls	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Panel B. Using *TS* as tax avoidance measure					
	(1)	(2)	(3)	(4)	(5)
			Quantile		
Variables	0.1	0.3	0.5	0.7	0.9
*During*Treat*	-0.000	-0.003	-0.007**	-0.011***	-0.009***
	(-0.132)	(-0.948)	(-2.258)	(-5.107)	(-10.784)
*Post*Treat*	-0.002	0.003**	-0.002	0.002	-0.001
	(-0.853)	(2.200)	(-0.694)	(0.445)	(-0.762)
Observations	13,926	13,926	13,926	13,926	13,926
Controls	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Panel C. Using *PERMD* as tax avoidance measure					
	(1)	(2)	(3)	(4)	(5)
			Quantile		
Variables	0.1	0.3	0.5	0.7	0.9
*During*Treat*	0.001**	-0.002	-0.003***	-0.004***	-0.007***
	(2.363)	(-1.640)	(-3.737)	(-5.802)	(-4.077)
*Post*Treat*	-0.000	0.003***	0.000	-0.001	0.001**
	(-0.022)	(4.081)	(0.076)	(-0.370)	(2.089)
Observations	13,712	13,712	13,712	13,712	13,712
Controls	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Panel B. Using *GETR3* as tax avoidance measure					
	(1)	(2)	(3)	(4)	(5)
			Quantile		
Variables	0.1	0.3	0.5	0.7	0.9
*During*Treat*	0.053***	0.000	-0.004***	-0.005***	-0.000
	(2.721)	(0.074)	(-9.176)	(-2.734)	(-0.063)
*Post*Treat*	-0.110***	-0.026***	-0.012***	-0.010***	0.000
	(-6.681)	(-8.400)	(-7.608)	(-10.663)	(0.051)
Observations	18,386	18,386	18,386	18,386	18,386
Controls	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y

Table 5. Tests for the Corporate Governance Channel (Product market threat)

This table shows the regression results using two subsamples divided by *Fluidity* in fiscal year 2004. If a firm has a higher product market fluidity than the median, then it belongs to high fluidity group, otherwise it belongs to low fluidity group. Panel A shows the results using high fluidity group, Panel B shows the results using low fluidity group. The dependent variable in Column (1) is *BTD*, *TS* in Column (2), *PERMD* in Column (3) and *GETR3* in Column (4). We control firm fixed effect and year fixed effect in all regressions. The robust t-stat is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. High Fluidity Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.015**	-0.015**	-0.004	0.077***
	(-2.397)	(-2.493)	(-0.722)	(2.739)
*Post*Treat*	-0.012**	-0.013**	0.001	0.053**
	(-2.007)	(-2.185)	(0.232)	(2.118)
Observations	4,186	4,080	3,988	5,420
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.692	0.689	0.614	0.168
Panel B. Low Fluidity Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.001	-0.001	0.001	0.031
	(-0.368)	(-0.428)	(0.260)	(1.520)
*Post*Treat*	-0.002	-0.002	-0.004	-0.010
	(-0.712)	(-0.709)	(-1.392)	(-0.446)
Observations	4,622	4,450	4,430	5,793
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.721	0.720	0.554	0.102

Table 6. Tests for the Corporate Governance Channel (E-index)

This table shows the regression results using two subsamples divided by E index in fiscal year 2004. If a firm has a higher E index than the median, then it belongs to high E index group, otherwise it belongs to low E index group. Panel A shows the results using high E index group, Panel B shows the results using low E index group. The dependent variable is *BTD* in Column (1), *TS* in Column (2), *PERMD* in Column (3) and *GETR3* in Column (4). We control firm fixed effect and year fixed effect in all regressions. The robust t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. High E index Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.009**	-0.008*	-0.009*	0.043*
	(-2.008)	(-1.866)	(-1.930)	(1.770)
*Post*Treat*	-0.005	-0.006	-0.011**	-0.001
	(-1.334)	(-1.358)	(-2.361)	(-0.037)
Observations	4,582	4,430	4,384	5,967
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.668	0.667	0.555	0.118
Panel B. Low E index Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.011**	-0.011**	-0.000	0.041
	(-2.279)	(-2.211)	(-0.088)	(1.512)
*Post*Treat*	-0.006	-0.007	0.002	0.001
	(-1.354)	(-1.547)	(0.441)	(0.041)
Observations	4,719	4,568	4,508	5,944
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.684	0.683	0.613	0.161

Table 7. Tests for the Corporate Governance Channel (Analyst Coverage)

This table shows the regression results using two subsamples divided by analyst coverage in fiscal year 2004. If a firm has more analyst following than the median, then it belongs to high analyst coverage group, otherwise it belongs to low analyst coverage group. Panel A shows the results using high analyst coverage group, Panel B shows the results using low analyst coverage group. The dependent variable is *BTD* in Column (1), *TS* in Column (2), *PERMD* in Column (3) and *GETR3* in Column (4). We control firm fixed effect and year fixed effect in all regressions. The robust t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. High Analyst Coverage Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.009**	-0.009*	-0.006	0.041*
	(-1.998)	(-1.879)	(-1.261)	(1.824)
*Post*Treat*	-0.004	-0.004	0.000	-0.019
	(-0.877)	(-0.745)	(0.026)	(-0.940)
Observations	6,430	6,215	6,190	7,921
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.683	0.682	0.583	0.148
Panel B. Low Analyst Coverage Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.010	-0.010	-0.013*	0.060**
	(-1.547)	(-1.572)	(-1.807)	(2.467)
*Post*Treat*	-0.004	-0.005	0.003	0.035
	(-0.812)	(-0.942)	(0.428)	(1.516)
Observations	6,194	6,031	5,911	8,259
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.757	0.755	0.711	0.152

Table 8. Tests for the Corporate Governance Channel (Institutional Ownership)

This table shows the regression results using two subsamples divided by institutional ownership in fiscal year 2004. If a firm has a higher institutional ownership than the median, then it belongs to high institutional ownership group, otherwise it belongs to low institutional ownership group. Panel A shows the results using high institutional ownership group, Panel B shows the results using low institutional ownership group. The dependent variable is *BTD* in Column (1), *TS* in Column (2), *PERMD* in Column (3) and *GETR3* in Column (4). We control firm fixed effect and year fixed effect in all regressions. The robust t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. High Institutional Ownership Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.008*	-0.008*	-0.003	0.049**
	(-1.835)	(-1.745)	(-0.605)	(2.475)
*Post*Treat*	-0.008*	-0.008**	-0.004	-0.006
	(-1.944)	(-2.018)	(-0.777)	(-0.295)
Observations	7,251	7,024	6,910	9,181
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.722	0.721	0.643	0.145
Panel B. Low Institutional Ownership Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.010*	-0.010	-0.016**	0.032
	(-1.660)	(-1.614)	(-2.248)	(1.353)
*Post*Treat*	-0.003	-0.004	0.003	0.005
	(-0.545)	(-0.658)	(0.439)	(0.243)
Observations	6,920	6,727	6,641	8,970
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.747	0.746	0.700	0.162

Table 9. The Impact of Short Selling on Different Equity Financing Dependent Firms

This table shows the regression results using subsamples divided by KZ index in fiscal year 2004. If a firm has a higher KZ index than the median, then it belongs to high KZ index group, otherwise it belongs to low KZ index group. Panel A shows the results using high institutional ownership group, Panel B shows the results using low institutional ownership group. The dependent variable is *BTD* in Column (1), *TS* in Column (2), *PERMD* in Column (3) and *GETR3* in Column (4). We control firm fixed effect and year fixed effect in all regressions. The robust t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. High KZ Index Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.016***	-0.015***	-0.017***	0.066***
	(-3.498)	(-3.289)	(-3.382)	(2.949)
*Post*Treat*	-0.008*	-0.009**	-0.008*	0.042*
	(-1.948)	(-2.019)	(-1.799)	(1.930)
Observations	6,784	6,589	6,504	9,025
Controls	Y	Y	Y	Y
Firm &Year FE	Y	Y	Y	Y
Adj-R squared	0.757	0.756	0.692	0.139
Panel B. Low KZ Index Group				
	(1)	(2)	(3)	(4)
Variables	*BTD*	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.003	-0.004	0.001	0.008
	(-0.544)	(-0.679)	(0.174)	(0.360)
*Post*Treat*	-0.002	-0.003	0.007	-0.033*
	(-0.458)	(-0.588)	(1.260)	(-1.697)
Observations	7,259	7,052	6,925	8,927
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.731	0.730	0.684	0.173

Table 10. Pre-trend Analysis.

This table displays the regression results of pre-trend test. Column(1) reports the regression result using *BTD* as tax avoidance measure, Column(2) reports the regression result using *TS* as tax avoidance measure, Column(3) reports the regression result using *PERMD* as tax avoidance measure, Column(4) reports the regression result using *GETR3*as tax avoidance measure. We control all the control variables, firm fixed effect and year fixed effect in both regressions. Variables' definitions are provided in Appendix A and paper. The robust t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1) *BTD*	(2) *TS*	(3) *PERMD*	(4) *GETR3*
*Year2003*Treat*	-0.005	-0.005	-0.005	-0.031
	(-0.811)	(-0.823)	(-0.722)	(-1.464)
*Year2004*Treat*	-0.002	-0.002	0.001	-0.020
	(-0.281)	(-0.349)	(0.167)	(-0.951)
*Year2005*Treat*	-0.008	-0.010	-0.005	-0.001
	(-1.391)	(-1.606)	(-0.780)	(-0.022)
*Year2006&2007*Treat*	-0.011**	-0.012**	-0.010*	0.026
	(-2.081)	(-2.085)	(-1.801)	(1.425)
*Post*Treat*	-0.008	-0.009*	-0.002	-0.012
	(-1.585)	(-1.745)	(-0.391)	(-0.712)
Observations	14,346	13,926	13,712	18,386
Controls	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Adj-R squared	0.738	0.737	0.683	0.155

Table 11. Placebo Test

This table displays the regression results of placebo tests. We randomly draw 579 pseudo pilot firms out of 1779 firms in fiscal year 2004 and use the pseudo pilot and non-pilot firms to perform the DID tests. We repeat the stimulation process for 500 times. The distributions of coefficients and t-stats of *Pseudo_Treat*During* are reported in the table. We control all the control variables, firm fixed effect and year fixed effect in both regressions. Variables' definitions are provided in Appendix A and paper. Standard errors are robust standard errors.*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Use *BTD* as the measure of tax avoidance.								
Stats	Obs	Mean	S.D.	P10	P25	Median	P75	P90
Coefficient	500	-0.001	0.004	-0.006	-0.003	-0.001	0.002	0.004
t-stat	500	-0.220	0.985	-1.420	-0.827	-0.245	0.448	0.957
Panel B. Use *TS* as the measure of tax avoidance.								
Stats	Obs	Mean	S.D.	P10	P25	Median	P75	P90
Coefficient	500	-0.001	0.004	-0.006	-0.003	-0.001	0.002	0.004
t-stat	500	-0.197	0.985	-1.406	-0.806	-0.194	0.473	0.970
Panel C. Use *PERMD* as the measure of tax avoidance.								
Stats	Obs	Mean	S.D.	P10	P25	Median	P75	P90
Coefficient	500	-0.000	0.004	-0.007	-0.004	-0.001	0.003	0.005
t-stat	500	-0.104	1.045	-1.393	-0.823	-0.092	0.610	1.269
Panel D. Use *GETR3* as the measure of tax avoidance.								
Stats	Obs	Mean	S.D.	P10	P25	Median	P75	P90
Coefficient	500	0.000	0.007	-0.010	-0.005	0.000	0.005	0.009
t-stat	500	0.013	1.053	-1.433	-0.657	0.039	0.744	1.338

Table 12. Alternative Tax Avoidance Measures.

This table displays the regression results using alternative tax avoidance measures. In both regressions, we use the full sample. We control all the control variables, firm fixed effect and year fixed effect in both regressions. Variables' definitions are provided in Appendix A and paper. The robust t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	*BTD_adj*	*TS_adj*	*PERMD_adj*	*GETR3_adj*	*TS2*	*CurrentETR*	*CETR3*
*During*Treat*	-0.008**	-0.008**	-0.007	0.034**	-0.008*	0.013**	-0.003
	(-1.980)	(-1.984)	(-1.527)	(2.334)	(-1.860)	(1.986)	(-0.290)
*Post*Treat*	-0.001	-0.002	0.004	0.000	-0.007	0.008	-0.027***
	(-0.390)	(-0.565)	(0.975)	(0.016)	(-1.622)	(1.348)	(-2.685)
Observations	14,346	13,926	13,712	18,386	12,339	12,644	16,693
Controls	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Adj-R squared	0.574	0.570	0.524	0.113	0.691	0.320	0.185

Table 13. Change Sample Periods

This table displays the regression results using different sample periods. In Panel A, we exclude the fiscal year 2005 sample, in Panel B, we exclude the fiscal year 2007 sample, in Panel C, we only use the sample before fiscal year 2008, which means *Post* equals 0, in Panel D, we only use the sample before fiscal year 2010. In Column (1), we use *BTD* as tax avoidance measure, in Column (2), we use *TS* as tax avoidance measure, in Column (3), we use *PERMD* as tax avoidance measure, in Column (4), we use *GETR3* as tax avoidance measure. We control all the control variables, firm fixed effect and year fixed effect in both regressions. Variables' definitions are provided in Appendix A and paper. The robust t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Exclude the observations of fiscal year 2005				
	(1)	(2)	(3)	(4)
	BTD	TS	*PERMD*	*GETR3*
During*Treat	-0.009**	-0.010**	-0.009*	0.038**
	(-2.172)	(-2.129)	(-1.832)	(2.201)
Post*Treat	-0.006	-0.007*	-0.001	0.000
	(-1.595)	(-1.751)	(-0.166)	(0.032)
Observations	13,002	12,625	12,433	16,782
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.735	0.734	0.680	0.150
Panel B. Exclude the observations of fiscal year 2007				
	(1)	(2)	(3)	(4)
	BTD	*TS*	*PERMD*	*GETR3*
*During*Treat*	-0.008*	-0.009**	-0.010**	0.051***
	(-1.716)	(-2.197)	(-2.260)	(2.726)
*Post*Treat*	-0.000	-0.005	-0.005	-0.002
	(-0.057)	(-1.449)	(-1.565)	(-0.156)
Observations	13,193	12,802	12,607	17,011
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.682	0.739	0.738	0.156
Panel C. Exclude the observations before fiscal year 2008 (Post=0)				
	(1)	(2)	(3)	(4)
	BTD	TS	*PERMD*	*GETR3*
During*Treat	-0.009**	-0.010**	-0.009**	0.039**
	(-2.412)	(-2.392)	(-2.018)	(2.567)
Observations	9,882	9,578	9,459	12,375
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.742	0.740	0.692	0.192
Panel D. Exclude the observations after fiscal year 2010				
	(1)	(2)	(3)	(4)
	BTD	TS	*PERMD*	*GETR3*
During*Treat	-0.010**	-0.010**	-0.009**	0.040***
	(-2.573)	(-2.517)	(-2.172)	(2.638)
Post*Treat	-0.005	-0.006	-0.001	-0.013
	(-1.132)	(-1.178)	(-0.220)	(-0.649)
Observations	11,680	11,327	11,171	14,926
Controls	Y	Y	Y	Y
Firm & Year FE	Y	Y	Y	Y
Adj-R squared	0.739	0.737	0.688	0.174

Appendix A. Definition of Variables

This table displays the definition and calculation of variables in this paper.

Variables	Definition
Dependent Variables	
BTD	Firms' total book-tax difference (Desai and Dharmapala, 2006), one measure of firms' tax avoidance level. *BTD =PI- TXFED/0.35*. Here PI is the pre-tax income, TXFED is the federal income tax. 0.35 is the federal tax rate during the sample period.
TS	Tax sheltering residual, which is the book-tax difference not attributable to total accruals (Desai and Dharmapala, 2006).
PERMD	The permanent book-tax difference (Frank, Lynch and Rego, 2009; Kim et al., 2011), which equals *PI- (TXFED+ TXFO)/0.35) – TXDI/0.35*. Here *TXDI* is the deferred income tax. 0.35 is the federal tax rate.
GETR3	3-year GAAP effective tax rate, which equals *TXT/ PI*, both *TXT* and *PI* are cumulated over three years before the calculation. *TXT* is the total income tax.
Independent Variables	
Treat	A dummy variable which equals 1 if the firm is a pilot firm, 0 otherwise.
During	A dummy variable which equals 1 if the firm's fiscal year falls in the pilot program period (2005- 2007), 0 otherwise.
Control Variables	
Post	A dummy variable which equals 1 if the firm's fiscal year falls after the pilot program ends, 0 otherwise.
SIZE	Firm size, equals the natural logarithm of total asset.
MB	Market to book ratio, which equals firms' market value of equity divided by book value of common equity. Firms' market value of equity equals closing stock price times share outstanding in the end of the fiscal year.
PPE	Firm's fixed asset ratio, equals the gross value of plant, property and equipment divided by total asset.
Intang	Firms' intangible asset ratio, equals firms' intangible asset divided by total asset.
NPM	Net profit margin, calculated as net income divided by total asset.
SaleGrowth	Sales growth, calculated as the change of sales divided by sales in t-1.
Loss	A dummy variable, equals 1 if pre-tax income is less than 0, 0 otherwise.
FI_dummy	A dummy variable, equals 1 if the firm has a positive and negative foreign income, 0 if the firm's foreign income equals 0 or missing.
Lev	Firms' leverage, equals total liability divided by total asset.
DP	Depreciation and amortization, equals depreciation and amortization divided by total asset.
CFO	Operating cash flow, divided by total asset.
Other Variables	
TAR	Total accruals, scaled by lagged total asset, equals change in current asset, minus change in current liabilities, minus change in cash, plus change in short-term debt, minus depreciation and amortization expense, then divided by total asset at the beginning of the fiscal year.
Fluidity	Product market fluidity, developed by Hoberg et al. (2014).
E index	Entrenchment index based on six provisions: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes, and supermajority requirements for mergers and charter amendments, developed by (Bebchuk et al., 2009)
Analyst Coverage	The number of analysts following the firm.
IO	Institutional ownership
KZ index	Developed by Kaplan and Zingales (1997), details are included in "Equity Financing Dependence" part.
BTD_adj	Size-and-industry adjusted book-tax difference, equals the difference between

	a firm's *BTD* and the average *BTD* of the firm's size and industry.
TS_adj	Size-and-industry adjusted tax sheltering residual, equals the difference between a firm's *TS* and the average *TS* of the firm's size and industry.
PERMD_adj	Size-and-industry permanent book-tax difference, equals the difference between a firm's *PERMD* and the average *PERMD* of the firm's size and industry.
GETR3_adj	Size-and-industry 3-year GAAP effective tax rate, equals the difference between a firm's *GETR3* and the average *GETR3* of the firm's size and industry.
TS2	Tax sheltering residual calculated using industry-year regressions.
CETR	Cash effective tax rate.
CurrentETR	Current effective tax rate.
CETR3	3-year cash effective tax rate.

Appendix B. Regression of *BTD* and *TA*

This table shows the results of Model (2). *TAR* is total accruals, which is calculated as change in current asset, minus change in current liabilities, minus change in cash, plus change in short-term debt, minus depreciation and amortization expense, then divided by total asset at the beginning of the fiscal year. Firm fixed effect is controlled. The t value is reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)
Varibales	*BTD*
TAR	0.045***
	(2.732)
Constant	-0.017***
	(-14.398)
Firm FE	Y
Observations	14,875
Adjusted R-squared	0.542