Tax avoidance and firm risk: Evidence from China

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Abstract

Prior literature (e.g., Guenther et al., 2017) documents puzzling evidence revealing that tax avoidance activities do not affect firm-specific risk. Using an extended US sample, we find that lower cash effective tax rates (ETRs) are associated with higher future return volatility, supporting the traditional view of tax risk-return trade-off. In sharp contrast to the US evidence, our analysis of Chinese firms suggests that Chinese state-owned enterprises (SOEs) with lower cash and GAAP ETRs tend to have lower future risk. In addition, we adopt a difference-in-differences approach based on the variations generated by two exogenous, anti-tax avoidance regulations in China but find no evidence suggesting a causal relationship between tax avoidance and firm risk. Overall, our results suggest that the relationship between tax avoidance and risk varies across countries, sample periods and tax aggressiveness measures, and we highlight the importance of addressing the endogenous nature in future research.

Keywords: effective tax rates, tax avoidance, firm risk.

1. Introduction

Corporate tax avoidance includes legal tax planning and illegal tax evasion aimed at reducing a firm's tax burden through investments and structuring business activities within tax laws' scopes or violations of tax laws and related regulations (Dyreng et al., 2014; Hanlon and Heitzman, 2010). Due to complexities and ambiguities in tax laws, tax authorities may have difficulties in determining a firm's proper taxes owed, particularly when it has aggressively avoided taxes (Hanlon et al., 2017). As a result, tax avoidance is pervasive in various jurisdictions (Badertscher et al., 2013; Chen et al., 2010).

According to the traditional view of risk-return trade-off, tax avoidance is associated with higher firm-specific risk (Rego and Wilson, 2012; Badertscher et al., 2013; Hasan et al., 2014). In particular, tax avoidance increases future cash flow uncertainty as firms' tax strategies might be challenged by tax authorities or depend on the persistence of tax laws (Blouin, 2014; Dhaliwal et al., 2017; Dyreng et al., 2014). Furthermore, aggressively avoiding current tax payments can also lead to lower transparency and greater information asymmetry because the disclosure of aggressive tax activities attracts attention from tax authorities and the public (Balakrishnan et al., 2019). Thus, tax avoidance behaviours lead to an increase in future firm risk (Rego and Wilson, 2012).

However, inconsistent with the notion that tax avoidance increases firm risk, Guenther et al. (2017) document puzzling results revealing that tax avoidance, when measured by the lower effective tax rate, is not related to future risk among US firms. Guenther et al. (2017) suggest that puzzling results are attributable to two reasons. First, US firms are able to invest in benign tax-favoured investments, such as tax-exempt municipal bonds. The future cash flows for this type of investments are more stable, lowering risk. Second, Guenther et al. (2017) argue that the empirical measures and methods in the literature are noisy and unreliable in tests of tax avoidance. They find that discretionary permanent book-tax differences (DTAX), tax shelter prediction or unrecognised tax benefits (UTB) are unreliable measures for "tax aggressiveness" because they reflect not only tax choices but also financial reporting choices (Guenther et al., 2017).

This study re-examines the association between tax avoidance and firm risk in China. The institutional and regulatory environments differ substantially between China and the US. While US firms can invest in benign, tax-favoured investments (such as tax-exempt municipal bonds) to reduce tax payments (Guenther et al., 2017), the Chinese government bond market is less developed, and Chinese firms heavily rely on aggressive transfer pricing activities to decrease tax payments (Leung et al., 2019). For example, firms prefer using

transfer pricing techniques and policies to reduce their tax base in higher tax rate jurisdictions or locations by shifting profits to lower tax rate locations or tax-havens. If firms aggressively use transfer pricing to avoid current tax payments, they will be more vulnerable to the persistence of tax laws and policy enforcement by tax authorities. This practice has become a major issue for supranational organisations, tax authorities, and even the public suggests that the negative relationship between tax avoidance and firm risk is more pronounced in China.

Second, the Chinese government plays an important role in business activities via control of state-owned enterprises (SOEs) and its influences over tax authorities and government-connected boards of directors in SOEs (Lin et al., 1998; Chan et al., 2013; Cen et al., 2017; Bradshaw et al., 2019). The association between tax avoidance and firm risk may differ between SOEs and non-SOEs due to differences in incentives and opportunities presented by tax avoidance strategies. For example, in SOEs, taxes represent a dividend to the state, the controlling shareholder, while taxes are also the state's primary revenue source (Qu et al., 2020). Managers in SOEs can have a higher incentive to pay more taxes to cater to state officials who have the power to influence managers' careers and political promotions (Bradshaw et al., 2019). Additionally, unlike non-SOEs, SOEs are owned by the state and less likely to be challenged by tax authorities, faceless cash-flow uncertainty and risks in the future, thereby leading to a lower effect of tax avoidance on firm risk.

Finally, we acknowledge that prior US evidence on tax avoidance and firm risk is subject to endogeneity (e.g., Gallemore and Labro, 2015; McClure et al., 2018). The Chinese setting enables us to exploit two significant changes in tax regulations to address the endogeneity concern. In contrast to prior US studies, we aim to establish the causal relationship between tax avoidance and firm risk by employing a difference-in-differences (DiD) research design that relies on two exogenous shocks in China resulting from new tax regulations in 2008 and 2015. The General Anti-avoidance Rules (GAAR) were initially introduced in 2008 as Chapter 10 of Measures for the Implementation of Special Tax Adjustments by the State Administration of Taxation of China (SAT). Subsequently, SAT issued the Administrative Measures for the GAAR in 2015, which provides more detailed guidelines for implementing the GAAR. These tax regulations have strengthened the tax law enforcement landscape in terms of tax avoidance activities in China by increasing the marginal costs of tax avoidance, leading to a potential and resultant reduction in tax avoidance activities (Leung et al., 2019). Thus, these two exogenous events in China enable us to examine the causal effect of tax avoidance changes on future firm risk due to regulation changes.

To examine the relationship between tax avoidance and firm risk, we conduct three sets of tests. First, we follow Guenther et al. (2017), re-examining the relationship in US firms from 1987 to 2010. Among the five main measures of tax avoidance based on the effective tax rate (ETR), we find that only the five-year cash ETR is negatively associated with firm risk. The results based on the four alternative measures of tax avoidance are mixed. We find that firms with discretionary, permanent book-tax differences have a higher risk, but those with higher predicted unrecognised tax benefits (UTB) have a lower risk. Overall, our evidence, based on the period from 1987 to 2010, is largely consistent with the findings of Guenther et al. (2017), suggesting that using tax avoidance strategies does not increase firm risk.

However, extending the sample period to 2019 shows that both three- and five-year cash ETRs, are significantly negative, indicating that lower cash ETRs are associated with higher firm risks. The remaining tax avoidance measures present mixed evidence, possibly because these alternative measures are likely to contain significant measurement errors, making them unreliable for capturing tax avoidances activities (Rego and Wilson, 2012). Thus, the results based on our extended sample support the traditional view of tax risk-return trade-off when long-term cash ETRs are used as tax avoidance measures. Firms with lower cash ETRs are likely to experience higher firm risk, although tax avoidance activities in general may not increase firm-specific risk. Additional testing confirms that our results are robust to the use of alternative measures of stock returns volatility, the inclusion of current period volatility as an additional control and alternative fixed effects.

Next, we examine the relationship between tax avoidance and firm risk using the Chinese sample and find that the firm risk is positively associated with both cash and GAAP ETRs, suggesting that using tax avoidance strategies tends to reduce firm risk in China. We further investigate whether the association between tax avoidance and firm risk differs between SOEs and non-SOEs. The results suggest that positive relations between ETRs and firm risk predominantly exist among SOEs, while tax avoidance behaviours among non-SOEs do not generally lead to changes in future firm-specific risk. Finally, we exploit two taxation regulation changes that potentially lead to an exogenous reduction in tax avoidance but do not directly impact firm risk via any channel other than taxation. Using the DiD approach to tackle the endogeneity problem, we find no significant evidence suggesting a causal relationship between tax avoidance and firm risk in China following the implementation of new regulations limiting tax avoidance behaviours.

Our study makes two important contributions. First, it adds to the ongoing debate about whether tax aggressiveness activities affect firm risk and valuation (Rego and Wilson, 2012; Badertscher et al., 2013; Hasan et al., 2014; Guenther et al., 2017) by conducting detailed analyses using an extended sample of US and Chinese firms. Our evidence on the negative relationship between cash ETRs and firm risk suggests that this relationship might depend on the tested sample period or the tax avoidance measure being used. In addition, although we find no significant evidence of a causal relationship between tax avoidance and firm risk, our analysis based on two exogenous regulation changes highlights the importance of addressing the endogenous nature in future research seeking to understand the consequences of corporate tax avoidance behaviour. Second, our study contributes to recent research on tax avoidance behaviours among Chinese listed firms, especially Chinese SOEs (Leung et al., 2019; Lin et al., 1998; Cen et al., 2017; Bradshaw et al., 2019; Qu et al., 2020). Our evidence that SOEs with lower cash and GAAP ETRs tend to have lower future risk sharply contrasts existing theories and empirical works based on US firms and calls for future research.

2. Sample

Our sample consists of US and Chinese firms. Following Guenther et al. (2017), our US sample begins with all observations available from the CRSP/Compustat merged database from 1987 to 2020, with 1987 being the first year that cash taxes paid are available on Compustat. Because several of our variables require five years of data, our stock return volatility measure requires one year of future data, and our tax rate volatility measure requires five years of future data. Our sample period effectively runs from 1992 to 2019 for tests using the stock return volatility measure.

Our Chinese sample begins with all observations available from the China Stock Market and Accounting Research (CSMAR) database from 1999 to 2019. We start with 1999 because this is the first year that key variables such as special items, cash tax payment and deferred tax are available on CSMAR. Our sample period effectively runs from 2005 to 2018 for tests using the stock return volatility measure and 2005 to 2014 for tests using the future tax rate volatility measure.[1]

2.1 Descriptive statistics

[1] Several variables require five years of data, including 5-Year Cash ETR, 5-Year GAAP ETR and Vol_CashFlow. The stock return volatility requires one year of future data, while tax rate volatility measures require five years of future data. Overall, key variables have enough observations for analysis since 2005,

We report descriptive statistics for the variables used in the analysis in Table 1. Panel A reports the US sample for 1987 to 2010, while Panel B reports the statistics for an extended sample from 1987 to 2019.[2] The mean (median) 5-Year Cash ETR of 26.2 per cent (27.3 per cent) is similar to the levels reported in Panel A and prior research. The mean (median) 5-Year GAAP ETR of 30.6 per cent (33.2 per cent) is higher, reflecting firms' tendencies to defer tax payments. The distribution of the Cash ETR Volatility appears to be positively skewed, with a mean of 22.2 per cent and median of 9.3 per cent.

Panel C in Table 1 presents descriptive statistics for the Chinese sample. The mean (median) 5-Year Cash ETR is 21.1 per cent (18.4 per cent). Consistent with the US sample, the mean (median) 5-Year GAAP ETR of 22.4 per cent (19.4 per cent) is higher than the 5-Year Cash ETR. This suggests that, similar to their US peers, Chinese listed firms are likely to defer tax payments. The Cash ETR Volatility distribution appears to be positively skewed, with a mean of 29.1 per cent and a median of 8.4 per cent.

[Table 1 about here]

3. Results

3.1 US results

We first re-examine the relationship between tax avoidance and firm risk using the US sample. Following Guenther et al. (2017), we estimate the following regression model:

$$\text{Future Return Volatility}_{t+1} = \beta_0 + \beta_1 \text{TAX}_{it} + \beta_2 \text{PTBI}_{it} + \beta_3 \text{Vol\_PTBI}_{it} + \beta_4 \text{BTM}_{it} + \beta_5 \text{Leverage}_{it} + \beta_6 \text{Size}_{it} + \beta_7 \text{Abn\_Accruals}_{it} + \beta_8 \text{Return}_{it} + \beta_9 \text{Inst\_Own}_{it} + \beta_{10} \text{Shares\_Out}_{it} + \beta_{11} \text{VolSpecialItems}_{it} + \beta_{12} \text{Vol\_CashFlow}_{it} + \beta_{13} \text{Vol\_ETBSO}_{it} + \beta_{14} \text{ETBSO}_{it} + \beta_{15} \text{CHG\_NOLCF}_{it} + \beta_{16} \text{NOLCF}_{it} + \beta_{17} \text{Loss}_{it} + \varepsilon_{it} \quad (1)$$

where Future Return Volatility is the standard deviation of monthly stock returns computed over the following year; TAX is the measure of tax avoidance; Size is the natural log of total assets (AT); PTBI is pre-tax book income (PI) scaled by lagged total assets; Leverage is year-end long-term debt (DLTT) scaled by lagged total assets; Vol_PTB is the standard deviation of annual pre-tax income (PI) scaled by lagged total assets (AT) measured over a five-year period; BTM is the year-end book value of equity (CEQ) over the price per share (PRCC_F) times the total number of shares outstanding (CSHO); Abn_Accruals is the square of year-end discretionary accruals, estimated using the modified Jones model from Dechow et al. (1996);

[2] Panel A reports the descriptive statistics for the sample period used by Guenther et al. (2017) as a benchmark for the sample period used in the current study.

Return is the annual buy and hold stock return measured over the fiscal year; Inst_Own is the firm's average institutional ownership measured over the fiscal year; Shares_Out is the log of the firm's common shares outstanding (CSHO); Vol_SpecialItems is the standard deviation of special items (SPI) scaled by lagged total assets (AT) measured over a five-year period; Vol_CashFlow is the standard deviation of operating cash flow (OANCF) scaled by lagged total assets (AT) measured over a five-year period; Vol_ETBSO is the standard deviation of the excess tax benefit of stock options (TXBCOF + TXBCO) scaled by lagged total assets (AT) measured over a five-year period; ETBSO is the excess tax benefit of stock options (TXBCOF + TXBCO) scaled by lagged total assets (AT); CHG_NOLCF is the change in net operating loss carry forward (NOLCF) scaled by lagged total assets (AT); NOLCF is the net operating loss carry forward (NOLCF) scaled by lagged total assets (AT); and Loss is an indicator variable equal to 1 if a firm has negative pre-tax income.

Table 2 presents results for examining the relationship between tax avoidance and firm risks using the US sample. Following Guenther et al. (2017), Panel A examines the relationship using the US sample from 1987 to 2010. In contrast to Guenther et al. (2017), we find that 5-Year Cash ETR (β = -0.014, t-stat = -2.35) is negatively associated with future stock volatility, suggesting that tax avoidance (i.e., lower ETRs) increases firm risk. Among the four alternative measures of tax avoidance in columns (6) to (9), we find a positive coefficient on DTAX (β = 0.005, t-stat = 5.36) but a negative coefficient on Predicted UTB (β = -0.267, t-stat = -1.84).[3] The significant coefficients on DTAX and Predicted UTB are inconsistent with Guenther et al. (2017), but present mixed evidence on the association between tax avoidance and firm risk. Overall, these results are largely consistent with the findings in Guenther et al. (2017), implying tax avoidance activities do not increase firm risk.

Next, we extend our sample period to 2019. Panel B shows that the coefficients on 5-Year Cash ETR (β = -0.020, t-stat = -4.44) and 3-Year Adjusted Cash ETR (β = -0.007, t-stat = -2.53) are negative and significantly associated with firm risk. Unlike the results in Panel A, the results in Panel B support that lower cash ETRs are associated with higher firm risk. For the alternative measures of risky tax avoidance, we find that the coefficient on DTAX is positively associated with higher firm risk in column (6), suggesting firms have a higher risk if they have more discretionary, permanent book-tax differences. However, the results in columns (7) and (8) suggest that both tax shelter and predicted UTB reduce firm risk. The

[3] As noted by Rego and Wilson (2012), these alternative measures are likely to contain significant measurement errors because we do not know when greater tax risk translates into higher stock return volatility. For these alternative tax avoidance measures, a positive coefficient indicates that tax avoidance leads to higher firm risk.

inconsistency among alternative measures reveals that they may be unreliable for capturing tax avoidance activities (Rego and Wilson, 2012). Collectively, the results from our extended sample suggest that firms with lower cash ETRs are likely to have higher firm risk, although tax avoidance activities in general may not increase firm risk.

[Table 2 about here]

3.2 Additional tests for US firms

Prior literature suggests that the relationship between firm risk and tax avoidance activities may be influenced by the means of measuring firm risk, the set of control variables and the use of fixed effects (Blaylock et al., 2020). Therefore, we examine the robustness of results via three sets of additional tests. First, we examine the robustness to alternative measures of future return volatility. Two alternative measures of return volatility are calculated using CRSP security files for monthly holding period returns (Future_vol_12month) and daily returns (Future_vol_day). Results reported in Panels A and B of Table 3 are consistent with results reported in Table 2. Both 5-Year Cash ETR (β = -0.020, t-stat = -4.69) and 3-Year Adjusted Cash ETR (β = -0.009, t-stat = -3.01) are negatively associated with Future_vol_12month. When we regress Future_vol_day on Tax and control variables in Panel B, 5-Year Cash ETR and 3-Year Adjusted Cash ETR are still negatively associated with firm risk. In addition, 5-Year GAAP ETR (β = -0.002, t-stat = -2.24) are also negatively related to firm risk calculated using daily stock returns. In Panels C, D and E, we include current period return volatility as an additional control.[4] In Panels F, G and H, we use industry and year fixed effects, instead of firm and year fixed effects. Overall, the results reported in these panels show that both cash and GAAP ETRs are negatively associated with future firm risks, which confirms the main results reported in Panel B of Table 2 over the sample period from 1987 to 2019.

[Table 3 about here]

3.3 Chinese results

We now turn to examine the association between tax avoidance and firm risk using the Chinese sample. Due to the data limitations, we can only include six tax avoidance measures in the Chinese sample: 5-Year Cash ETR, 5-Year GAAP ETR, 3-Year Adjusted Cash ETR, 3-Year Adjusted GAAP ETR, Cash ETR Volatility and DTAX. The results reported in Table 4 show that, while the coefficients on Cash ETR Volatility and DTAX are statistically

[4] Shan et al. (2014) and Wei and Zhang (2006) highlight the importance of controlling for current period stock return volatility when explaining future return volatility.

insignificant, both Cash and GAAP ETRs are positively associated with the future firm risk, suggesting that firms with higher degrees of tax avoidance tend to have lower firm risk in the future. A possible explanation for this is that higher ETRs can signal greater uncertainty of future return, imposing higher firm risk. This notion is supported by Thomas and Zhang (2014) and Blaylock et al. (2020), and consistent with the findings of Guenther et al. (2017). For example, Thomas and Zhang (2014) suggest that the tax rate is an informative signal for firms' performances, and high tax rates reflect high future profitability. Similarly, Blaylock et al. (2020) find that taxable income positively predicts future pre-tax cash flows, pre-tax book income, and "street" pre-tax earnings, suggesting that taxable income provides incremental information to book income regarding performance.

[Table 4 about here]

3.4 Chinese results: SOE vs. non-SOE firms

In China, the state is the controlling shareholder of SOEs and has significant influence over tax authorities and government-connected SOE boards of directors. Therefore, taxes represent both the dividend to an SOE's controlling shareholder and the revenue resource for the state (Qu et al., 2020). Compared to non-SOEs, managers in SOEs can have higher incentive to pay more taxes to cater to state officials who have the power to influence managers' careers and political promotions (Lin et al., 1998; Cen et al., 2017; Bradshaw et al., 2019). In addition, unlike non-SOEs, SOEs are state-owned, less likely to be challenged by tax authorities and face less cash flow uncertainty and fewer future risks, leading to a lower tax avoidance effect on firm risk. Collectively, we expect that the association between tax avoidance and firm risk can differ between SOEs and non-SOEs due to differences in incentives and opportunities for tax avoidance strategies.

In Table 5, by dividing the sample into SOEs and non-SOEs, we find that coefficients on ETRs are statistically significant and positively related to firm risk among SOEs. However, most coefficients on ETRs are statistically insignificant among non-SOEs. The only exception is the coefficient on 3-year Adjusted GAAP ETR, which is marginally significant (β = 0.009, t-stat = 1.94). Overall, the results in Table 5 suggest that the association between tax avoidance and firm risk differs significantly between SOEs and non-SOEs. Tax avoidance behaviours among non-SOEs generally do not lead to higher future firm-specific risk, consistent with the US results in Guenther et al. (2017). In contrast, we find that SOEs with lower cash and GAAP ETRs tend to have lower future risk, which calls for additional research to understand the underlying reasons. One possibility is that managers in SOEs have higher incentives to pay more taxes due to their political or career concerns (Lin et al., 1998;

Cen et al., 2017; Bradshaw et al., 2019). Because higher ETRs can signal greater uncertainty of future return (Thomas and Zhang, 2014; Guenther et al., 2017; Blaylock et al., 2020), such behaviour among managers is likely to impose higher firm risk in SOEs.

[Table 5 about here]

3.5 Chinese results: evidence based on two taxation regulation changes

Similar to prior studies, the above analysis of tax avoidance and firm risk is subject to endogeneity, which prevents us from establishing a causal relationship between tax avoidance strategies and firm risk (Gallemore and Labro, 2015; McClure et al., 2018). In this part, we exploit two exogenous shocks in China caused by new tax regulations in 2008 and 2015 and use the DiD approach to tackle the endogeneity problem.

The initial introduction of the GAAR in 2008, and the subsequent Administrative Measures for the GAAR in 2015 have significantly strengthened the tax law enforcement landscape in terms of corporate tax avoidance in China by increasing the marginal costs of tax avoidance strategies, such as potential tax penalties imposed by tax authorities, the costs associated with implementation and agency costs resulting from tax avoidance activities (Scholes et al., 1992; Desai and Dharmapala, 2006; Chen et al., 2010; Leung et al., 2019). The GAAR make several significant changes in Chinese tax regulations. For example, they enable tax authorities to assess and make tax adjustments in areas such as transfer pricing, tax haven utilisation, thin capitalisation and the use of foreign-controlled corporations. In addition, they consolidate previously separated tax laws for domestic enterprises and foreign investment enterprises. As a result, firms now have fewer opportunities to effectively reduce taxes. Thus, we expect that these two new tax regulations from 2008 and 2015 lead to an exogenous reduction in tax avoidance but do not directly impact firm risk via any channel other than taxation. Thus, these examples provide us with a unique opportunity to draw causal inference from the association between tax avoidance and firm risk.

We estimate the following regression models under the framework of the DiD method:

$$\text{Future Return Volatility}_{t+1} = \beta_0 + \beta_1 \text{TAX}_{it} + \beta_2 \text{Post}_{it} + \beta_3 \text{Post}_{it} \times \text{Tax}_{it} + \beta_4 \text{PTBI}_{it} + \beta_5 \text{Vol\_PTBI}_{it} + \beta_6 \text{BTM}_{it} + \beta_7 \text{Leverage}_{it} + \beta_8 \text{Size}_{it} + \beta_9 \text{Abn\_Accruals}_{it} + \beta_{10} \text{Return}_{it} + \beta_{11} \text{Inst\_Own}_{it} + \beta_{12} \text{Shares\_Out}_{it} + \beta_{13} \text{VolSpecialItems}_{it} + \beta_{14} \text{Vol\_CashFlow}_{it} + \beta_{15} \text{Vol\_ETBSO}_{it} + \beta_{16} \text{ETBSO}_{it} + \beta_{17} \text{CHG\_NOLCF}_{it} + \beta_{18} \text{NOLCF}_{it} + \beta_{19} \text{Loss}_{it} + \varepsilon_{it} \quad (2)$$

where Post is an indicator variable taking the value of one for firm years after 2008 in accordance with the introduction of the GAAR (or after 2015 for the Administrative Measures for the GAAR), and zero otherwise.[5]

Panel A, Table 6 reports the results of the DiD analysis around the initial introduction of the GAAR in 2008, while Panel B reports the result for the Administrative Measures for the GAAR in 2015. Results in Panel A show that the key variables of interest – the interaction terms between TAX and Post – are positive and significant only when using 5-Year GAAP ETR (β = 0.026, t-stat = 1.87) as the measure of tax avoidance. In addition, the significantly negative coefficient for the interaction term Post × Cash ETR Volatility (β = -0.008, t-stat = -2.30) indicates that the DiD approach detects the negative association between future stock return volatility and the firm's tax rate volatility after the change of regulation. In Panel B, we find a significant and positive coefficient on Post × Cash ETR Volatility (β = 0.004, t-stat = 2.59). However, most other measures of tax avoidance are found to be statistically insignificant in both panels. Collectively, after the implementation of the new regulations that limit tax avoidance behaviours, we find no significant evidence of a causal relationship between tax avoidance and firm risk in China.

[Table 6 about here]

4. Conclusion

This study re-examines the relationship between tax avoidance activities and firm risk using both US and Chinese firms. Based on our extended US sample, we find that lower cash ETRs are associated with higher future stock return volatility, supporting the notion that firms engaged in tax avoidance activities possess higher firm risk (Rego and Wilson, 2012; Badertscher et al., 2013; Hasan et al., 2014). However, we do not have supportive evidence when using alternative tax avoidance measures. For Chinese firms, we find that ETRs are positively associated with future stock return volatility, suggesting that using tax avoidance strategies does not increase but tends to reduce firm risk (Thomas and Zhang, 2014; Guenther et al., 2017; Blaylock et al., 2020). Furthermore, we find that this positive relationship exists primarily among Chinese SOEs, highlighting the differences in control, managerial incentives and regulatory environments between SOEs and non-SOEs. Finally, by relying on two anti-

[5] In the DiD analysis, we exclude observations in 2008 and 2009 for the initial introduction of GAAR in 2008, and 2014 and 2015 for the Administrative Measures for the GAAR in 2015 to avoid capturing any confounding effect. In addition, we exclude DTAX as the measure of tax avoidance in 2008 and 2009, since the data for DTAX is only available since 2008.

tax avoidance regulation changes in China, our DiD analysis finds no significant evidence of a causal relationship between tax avoidance activities and firm risk.

Overall, our study contributes to the ongoing debate regarding whether tax aggressiveness activities affect firm risk and valuation by conducting detailed analyses using an extended sample of US and Chinese firms, especially Chinese SOEs. Our analyses and findings highlight the importance of addressing the endogenous issue in future research and continuing studies on tax avoidance behaviours.

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Appendix: Variable Definitions

Panel A Tax Avoidance Measures

Variable Name	Description
TAX	One of the measures of tax avoidance activity, defined based on the column.
5-Year Cash ETR	The five-year sum (from year t-4 to year t) of cash taxes paid, divided by the five-year sum of pre-tax income, minus special items. Firms are required to have a positive denominator, and Cash ETR is winsorised at 0 and 1. Based on the measure developed by Dyreng et al. (2008).
5-Year GAAP ETR	The five-year sum (from year t-4 to year t) of tax expenses, divided by the five-year sum of pre-tax income, minus special items. Firms are required to have a positive denominator, and Cash ETR is winsorised at 0 and 1. Based on the measure developed by Dyreng et al. (2008).
3-Year Adjusted Cash ETR	The three-year sum (from year t-2 to year t) of cash taxes paid, divided by the three-year sum of pre-tax income, adjusted by the same period three-year ETR for the portfolio of firms in the same quintile of total assets and the same industry. Based on the measure developed by Balakrishnan et al. (2019).
3-Year Adjusted GAAP ETR	The three-year sum (from year t-2 to year t) of tax expenses, divided by the three-year sum of pre-tax income, adjusted by the same period three-year ETR for the portfolio of firms in the same quintile of total assets and the same industry. Based on the measure developed by Balakrishnan et al. (2019).
Cash ETR Volatility (historical)	The standard deviation of annual cash taxes paid, divided by pre-tax income, minus special items over the past five-year period.
Cash ETR Volatility ((future))	The standard deviation of annual cash taxes paid, divided by pre-tax income, minus special items over the future five-year period.
DTAX	Model of discretionary book-tax differences developed by Frank et al. (2009).
Shelter	An indicator variable set equal to 1 for firms in the top quintile of the predicted probability that the firm is engaged in tax sheltering, based on the model from Wilson (2009).
Predicted UTB	Predicted unrecognised benefits at the end of year t, based on the model from Rego and Wilson (2012).
Reported UTB	Reported unrecognised tax benefits (TXTUBEND) scaled by lagged assets (AT).

Panel B Other Variables

Variable Name	Description
Future_vol_12month	The standard deviation of monthly stock returns (RET) over the subsequent year. Monthly stock returns are sourced from the CRSP monthly stock file.
Future_vol_day	The standard deviation of daily stock returns (RET) over the subsequent year. Monthly stock returns are sourced from the CRSP monthly stock file. Daily stock returns are sourced from the CRSP daily stock file.
Future_vol_trt1m	The standard deviation of monthly total stock returns (TRT1M) over the subsequent year. Monthly stock returns are sourced from the CRSP/Compustat merged security monthly file.
SD_Return	The standard deviation of monthly stock returns over the subsequent year in China.
Return	The firm's annual stock return measured over the fiscal year in China.
Size	Natural log of total assets.
BTM	Book value of equity over the price per share, times total common shares outstanding.
Leverage	Long-term debt scaled by lagged total assets.
Inst_Own	The firm's institutional ownership measured over the fiscal year.
Shares_Out	The log of the firm's common shares outstanding.
PTBI	Pre-tax book income scaled by lagged total assets. When computing DTAX, we use all Compustat/CSMAR firm-year observations with the available data.
Vol_PTBI	The standard deviation of the ratio of annual pre-tax book income to lagged total assets measured over a five-year period.
Abn_Accruals	The discretionary accruals, where discretionary accruals are estimated using the modified Jones method from Dechow et al. (1996). When computing discretionary accruals, we use a sample of all Compustat/CSMAR firm-year observations with the available data.
Vol_SpecialItems	The standard deviation of special items scaled by lagged total assets measured over a five-year period.
Vol_CashFlow	The standard deviation of operating cash flow scaled by lagged total assets measured over a five-year period.

NOLCF	Net operating loss carryforward scaled by lagged total assets. NOLCF is set equal to 0 if missing.
CHG_NOLCF	Change in net operating loss carryforward scaled by lagged total assets. NOLCF is set equal to 0 if missing.
Loss	An indicator variable equal to 1 if a firm has negative pre-tax income.

Table 1 Descriptive statistics

	Panel A: US firms 1987-2010						Panel B: US firms 1987-2019					
	N	Mean	Std. Dev.	25th Percentile	Median	75th Percentile	N	Mean	Std. Dev.	25th Percentile	Median	75th Percentile
Future_vol_12month	68231	0.142	0.088	0.082	0.120	0.176	86003	0.135	0.085	0.077	0.113	0.167
Future_vol_month	68237	0.152	0.078	0.096	0.135	0.187	86011	0.145	0.076	0.091	0.128	0.180
Future_vol_day	68305	0.038	0.023	0.022	0.032	0.047	86088	0.035	0.022	0.020	0.029	0.044
Future_vol_trt1m	73967	0.149	0.098	0.083	0.123	0.183	92830	0.141	0.094	0.078	0.116	0.173
5-Year Cash ETR	29052	0.274	0.119	0.199	0.285	0.353	39249	0.262	0.120	0.186	0.273	0.343
5-Year GAAP ETR	32418	0.320	0.097	0.284	0.343	0.380	42782	0.306	0.104	0.262	0.332	0.374
3-Year Adjusted Cash ETR	42769	0.018	0.139	-0.072	0.024	0.100	54869	0.010	0.138	-0.082	0.014	0.091
3-Year Adjusted GAAP ETR	43842	0.011	0.118	-0.030	0.033	0.076	56062	0.003	0.122	-0.046	0.027	0.072
Cash ETR Volatility	50903	0.228	0.508	0.049	0.097	0.191	64520	0.222	0.500	0.047	0.093	0.183
DTAX	40252	0.021	0.580	-0.093	0.050	0.205	53174	0.035	0.589	-0.093	0.048	0.209
Shelter	16579	0.187	0.390	0.000	0.000	0.000	23816	0.224	0.417	0.000	0.000	0.000
Predicted UTB	17015	0.012	0.009	0.007	0.011	0.016	24469	0.012	0.009	0.007	0.011	0.016
Reported UTB	7021	0.012	0.018	0.002	0.006	0.015	22836	0.010	0.017	0.001	0.004	0.012
PTBI	73967	0.023	0.184	-0.008	0.053	0.112	92830	0.023	0.182	-0.007	0.052	0.109
Vol_PTBI	73967	0.055	0.064	0.019	0.037	0.067	92830	0.054	0.064	0.018	0.036	0.065
BTM	73967	0.693	0.609	0.314	0.534	0.860	92830	0.675	0.602	0.302	0.519	0.838
Leverage	73967	0.167	0.173	0.005	0.119	0.281	92830	0.171	0.175	0.004	0.127	0.286
Size	73967	5.525	2.090	4.005	5.393	6.902	92830	5.796	2.151	4.218	5.698	7.261
Abn_Accruals	73967	0.012	0.030	0.000	0.002	0.009	92830	0.011	0.029	0.000	0.002	0.008
Return	73967	0.153	0.646	-0.240	0.051	0.373	92830	0.144	0.613	-0.224	0.054	0.356
Inst_Own	73967	0.427	0.298	0.156	0.407	0.670	92830	0.469	0.314	0.179	0.467	0.738
Shares_Out	73967	2.969	1.380	1.973	2.848	3.822	92830	3.154	1.413	2.135	3.080	4.026
Vol_SpecialItems	73967	0.035	0.065	0.002	0.011	0.036	92830	0.034	0.064	0.002	0.011	0.035
Vol_CashFlow	73967	0.073	0.071	0.029	0.051	0.090	92830	0.069	0.070	0.027	0.048	0.085
Vol_ETBSO	73967	0.000	0.001	0.000	0.000	0.000	92830	0.000	0.001	0.000	0.000	0.000
ETBSO	73967	0.000	0.001	0.000	0.000	0.000	92830	0.000	0.001	0.000	0.000	0.000

CHG_NOLCF	73967	0.018	0.204	0.000	0.000	0.000	92830	0.021	0.222	0.000	0.000	0.000
NOLCF	73967	0.138	0.518	0.000	0.000	0.022	92830	0.181	0.610	0.000	0.000	0.052
Loss	73967	0.267	0.442	0.000	0.000	1.000	92830	0.267	0.442	0.000	0.000	1.000

Table 1 (continued)

Panel C: China Firms 1999-2019	N	Mean	Std. Dev.	25th Percentile	Median	75th Percentile
SD_Return	20,909	0.132	0.061	0.089	0.119	0.160
5-Year Cash ETR	23,268	0.211	0.136	0.138	0.184	0.258
5-Year GAAP ETR	23,954	0.224	0.136	0.151	0.194	0.273
3-Year Adjusted Cash ETR	23,800	0.000	0.150	-0.077	-0.022	0.040
3-Year Adjusted GAAP ETR	23,954	0.000	0.147	-0.072	-0.027	0.035
Cash ETR Volatility (historical)	19,909	0.291	0.767	0.040	0.084	0.199
DTAX	23,347	0.008	0.057	-0.011	0.008	0.031
PTBI	20,909	0.053	0.087	0.015	0.043	0.084
Vol_PTBI	20,909	0.062	0.123	0.016	0.031	0.059
BTM	20,909	0.682	0.631	0.289	0.494	0.838
Leverage	20,909	0.246	0.304	0.024	0.128	0.361
Size	20,909	22.229	1.282	21.366	22.095	22.971
Abn_Accruals	20,909	-0.005	0.151	-0.070	-0.008	0.058
Return	20,909	0.222	0.752	-0.274	-0.015	0.481
Inst_Own	20,909	7.141	7.874	1.293	4.391	10.272
Shares_Out	20,909	13.003	1.024	12.314	12.930	13.607
Vol_SpecialItems	20,909	0.019	0.041	0.003	0.006	0.016
Vol_CashFlow	20,909	0.080	0.105	0.032	0.053	0.087
NOLCF	20,909	0.001	0.003	0.000	0.000	0.001
CHG_NOLCF	20,909	0.000	0.002	0.000	0.000	0.000

This table reports the summary of sample selection criteria and the descriptive statistics for selected variables used in the analysis. The samples consist of 73,967 firm-year observations between 1987 and 2010 in Panel A, 92,830 firm-year observations between 1987 and 2019 in Panel B and 20,909 firm-year observations between 1999 and 2019 in Panel C, respectively. All variables are defined in the Appendix.

Table 2 The Relation between Tax Avoidance and Firm Risk: US firms

Panel A: 1987-2010	Dependent variable=Future_vol_trt1m								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
TAX	-0.014**	-0.004	-0.003	0.005	0.000	0.005***	-0.002	-0.267*	0.200
	(-2.35)	(-0.53)	(-0.87)	(1.27)	(0.19)	(5.36)	(-1.15)	(-1.84)	(1.64)
PTBI	-0.033**	-0.033**	-0.035***	-0.036***	-0.060***	-0.069***	-0.053***	-0.028***	-0.014
	(-2.34)	(-2.44)	(-3.06)	(-3.15)	(-6.63)	(-14.09)	(-7.49)	(-3.62)	(-1.07)
Vol_ PTBI	0.069**	0.065**	0.066***	0.063**	0.081***	0.055***	0.069***	0.076***	0.132***
	(2.22)	(2.23)	(2.60)	(2.50)	(3.64)	(4.30)	(3.69)	(4.54)	(4.27)
BTM	0.025***	0.025***	0.023***	0.024***	0.023***	0.026***	0.022***	0.022***	0.040***
	(11.31)	(12.02)	(13.21)	(13.58)	(14.27)	(15.10)	(7.88)	(8.00)	(8.40)
Leverage	0.049***	0.050***	0.041***	0.041***	0.042***	0.054***	0.041***	0.040***	0.059***
	(8.67)	(9.57)	(9.20)	(9.49)	(10.15)	(9.29)	(4.91)	(5.42)	(2.77)
Size	-0.011***	-0.012***	-0.012***	-0.012***	-0.012***	-0.019***	-0.014***	-0.014***	0.004
	(-6.70)	(-8.30)	(-9.55)	(-9.95)	(-10.83)	(-11.64)	(-5.63)	(-6.03)	(0.80)
Abn_Accruals	0.039	0.051*	0.067***	0.062***	0.057***	-0.004	0.003	0.047	-0.100*
	(1.24)	(1.80)	(3.10)	(2.91)	(2.95)	(-0.17)	(0.08)	(1.41)	(-1.89)
Return	0.006***	0.006***	0.006***	0.006***	0.007***	0.002**	0.003**	0.004***	-0.001
	(6.08)	(6.47)	(8.26)	(8.51)	(9.89)	(2.41)	(2.51)	(3.34)	(-0.71)
Inst_Own	-0.001	0.001	-0.003	-0.002	-0.004	0.002	-0.003	-0.004	0.001
	(-0.22)	(0.14)	(-0.98)	(-0.61)	(-1.37)	(0.46)	(-0.48)	(-0.70)	(0.07)
Shares_Out	0.007***	0.010***	0.009***	0.009***	0.009***	0.012***	0.008***	0.007***	-0.008
	(5.00)	(7.26)	(6.93)	(7.26)	(7.59)	(6.40)	(3.21)	(3.21)	(-1.40)
Vol_SpecialItems	0.058**	0.050**	0.013	0.017	0.032**	-0.002	-0.026	-0.022	0.027
	(2.57)	(2.42)	(0.90)	(1.22)	(2.49)	(-0.17)	(-1.39)	(-1.22)	(0.86)
Vol_CashFlow	0.060***	0.055***	0.060***	0.064***	0.052***	0.041***	0.095***	0.079***	-0.008
	(2.70)	(2.62)	(4.16)	(4.51)	(3.98)	(2.96)	(4.29)	(3.73)	(-0.20)
Vol_ETBSO	-3.135***	-3.187***	-3.273***	-3.274***	-3.195***	-2.338***	-2.920***	-2.938***	-0.497
	(-7.20)	(-7.40)	(-8.10)	(-8.10)	(-8.26)	(-4.88)	(-4.80)	(-4.88)	(-0.70)

ETBSO	0.414	0.392	0.587*	0.508*	0.627**	1.395***	0.811*	1.094**	0.316
	(1.28)	(1.22)	(1.93)	(1.70)	(2.12)	(3.99)	(1.85)	(2.46)	(0.57)
CHG_NOLCF	0.005	0.000	0.004	0.008	0.002	0.005	0.012**	0.012**	-0.002
	(0.53)	(0.00)	(0.72)	(1.28)	(0.40)	(1.46)	(2.15)	(2.21)	(-0.35)
NOLCF	-0.005	-0.000	-0.003	-0.001	-0.000	-0.004*	-0.002	-0.001	-0.003
	(-0.59)	(-0.03)	(-0.64)	(-0.19)	(-0.09)	(-1.82)	(-0.66)	(-0.18)	(-0.49)
Loss	0.013***	0.012***	0.013***	0.013***				0.013***	0.012***
	(4.90)	(4.72)	(6.03)	(6.12)				(6.11)	(3.62)
Constant	0.120***	0.137***	0.140***	0.143***	0.147***	0.185***	0.167***	0.168***	0.132***
	(14.02)	(18.17)	(23.98)	(24.86)	(27.03)	(26.41)	(14.24)	(14.17)	(3.64)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,052	32,418	42,769	43,842	50,903	40,252	16,579	17,015	7,021
Adjusted R^2	0.234	0.225	0.205	0.205	0.193	0.193	0.250	0.251	0.296

Table 2 (continued)

Panel B: 1987-2019	Dependent variable=Future_vol_trt1m								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
TAX	-0.020***	-0.003	-0.007**	0.005	0.000	0.004***	-0.003*	-0.363***	-0.028
	(-4.44)	(-0.62)	(-2.53)	(1.47)	(0.46)	(5.59)	(-1.93)	(-3.02)	(-0.47)
PTBI	-0.040***	-0.039***	-0.040***	-0.041***	-0.061***	-0.067***	-0.053***	-0.033***	-0.046***
	(-3.33)	(-3.42)	(-4.03)	(-4.14)	(-7.75)	(-15.75)	(-8.73)	(-5.06)	(-6.07)
Vol_ PTBI	0.082***	0.078***	0.074***	0.072***	0.086***	0.063***	0.073***	0.076***	0.090***
	(3.19)	(3.19)	(3.46)	(3.38)	(4.58)	(5.73)	(4.70)	(5.36)	(5.51)
BTM	0.024***	0.024***	0.022***	0.022***	0.022***	0.028***	0.024***	0.024***	0.040***
	(12.35)	(12.93)	(14.58)	(14.81)	(16.03)	(18.33)	(10.08)	(10.01)	(16.11)
Leverage	0.041***	0.043***	0.039***	0.040***	0.042***	0.056***	0.047***	0.048***	0.063***
	(9.23)	(10.16)	(10.54)	(10.99)	(12.10)	(11.95)	(7.63)	(8.50)	(9.20)
Size	-0.010***	-0.011***	-0.011***	-0.012***	-0.012***	-0.017***	-0.015***	-0.015***	-0.009***
	(-8.27)	(-9.97)	(-11.72)	(-12.25)	(-13.52)	(-13.41)	(-8.01)	(-8.78)	(-4.64)
Abn_Accruals	0.065**	0.069**	0.079***	0.075***	0.069***	0.004	0.011	0.050*	0.000
	(2.19)	(2.51)	(3.87)	(3.70)	(3.75)	(0.24)	(0.41)	(1.77)	(0.01)
Return	0.005***	0.005***	0.005***	0.006***	0.006***	0.002***	0.003***	0.004***	0.001
	(5.83)	(6.35)	(8.01)	(8.21)	(9.94)	(2.88)	(2.98)	(3.82)	(0.82)
Inst_Own	-0.003	-0.002	-0.004*	-0.003	-0.004**	-0.003	-0.007*	-0.008**	-0.003
	(-1.40)	(-1.01)	(-1.80)	(-1.51)	(-2.10)	(-0.93)	(-1.90)	(-2.17)	(-0.88)
Shares_Out	0.005***	0.007***	0.007***	0.007***	0.008***	0.009***	0.007***	0.007***	0.000
	(4.31)	(6.27)	(6.23)	(6.54)	(7.33)	(6.26)	(3.48)	(3.94)	(0.02)
Vol_SpecialItems	0.052***	0.049***	0.026**	0.028***	0.039***	0.012	0.013	0.010	0.026**
	(3.32)	(3.36)	(2.31)	(2.60)	(3.67)	(1.15)	(0.91)	(0.77)	(2.18)
Vol_CashFlow	0.078***	0.075***	0.070***	0.072***	0.062***	0.044***	0.090***	0.074***	0.021
	(4.38)	(4.30)	(5.59)	(5.92)	(5.38)	(3.80)	(5.14)	(4.27)	(1.21)
Vol_ETBSO	-1.595***	-1.505***	-1.629***	-1.641***	-1.647***	-0.911***	-1.307***	-1.323***	-0.226
	(-5.40)	(-5.14)	(-5.89)	(-5.95)	(-6.07)	(-2.87)	(-3.22)	(-3.21)	(-0.71)

ETBSO	0.028	-0.002	0.148	0.138	0.191	0.914***	0.632**	0.696**	0.221
	(0.12)	(-0.01)	(0.69)	(0.65)	(0.91)	(3.71)	(2.07)	(2.24)	(0.75)
CHG_NOLCF	0.004	0.000	0.002	0.004	0.001	0.003	0.006*	0.008**	-0.001
	(0.92)	(0.04)	(0.51)	(0.89)	(0.18)	(1.31)	(1.80)	(2.38)	(-0.43)
NOLCF	-0.007*	-0.003	-0.007**	-0.005*	-0.004	-0.002	-0.003	-0.002	0.003
	(-1.70)	(-0.98)	(-2.13)	(-1.73)	(-1.60)	(-1.49)	(-1.60)	(-0.99)	(1.44)
Loss	0.012***	0.011***	0.012***	0.012***				0.011***	0.008***
	(6.03)	(5.76)	(6.85)	(6.98)				(6.31)	(4.55)
Constant	0.123***	0.137***	0.142***	0.145***	0.148***	0.177***	0.169***	0.172***	0.190***
	(18.87)	(22.87)	(28.25)	(29.41)	(31.47)	(28.40)	(17.85)	(17.15)	(15.08)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39,249	42,782	54,869	56,062	64,520	53,174	23,816	24,469	22,836
Adjusted R^2	0.242	0.234	0.219	0.219	0.206	0.201	0.254	0.257	0.261

This table examines the association between tax avoidance and firm risk using the following model:

Future Return Volatility$_{t+1}$= β_0+ β_1 TAX$_{it}$+ β_3 PTBI$_{it}$ +β_4 Vol_PTBI$_{it}$+ β_5 BTM$_{it}$+ β_6 Leverage$_{it}$+ β_7 Size$_{it}$ + β_8 Abn_Accruals$_{it}$+ β_9 Return$_{it}$+ β_{10} Inst_Own$_{it}$ + β_{11} Shares_Out$_{it}$+ β_{12} VolSpecialItems$_{it}$+ β_{13} Vol_CashFlow$_{it}$+ β_{14} Vol_ETBSO$_{it}$+ β_{15} ETBSO$_{it}$+ β_{16} CHG_NOLCF$_{it}$+ β_{17} NOLCF$_{it}$+ β_{18} Loss$_{it}$+ ε_{it}

where Future Return Volatility is the standard deviation of monthly stock returns computed over the following year; and TAX is the measure of tax avoidance. ε is the error term. All variables are defined in the Appendix. Figures in parentheses are t-statistics. *** (**, *) indicates significant at the 1% (5%, 10%) level for two-tailed test.

Table 3 Additional tests: US firms over 1987-2019

Panel A and B: Alternative measures of future return volatility

Panel A	Dependent variable=Future_vol_12month								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
Tax	-0.020***	-0.001	-0.009***	0.004	-0.001	0.003***	-0.002	-0.424***	-0.062
	(-4.69)	(-0.10)	(-3.01)	(1.22)	(-0.87)	(4.48)	(-1.52)	(-3.54)	(-1.14)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,298	40,709	51,940	53,064	60,983	49,065	22,424	23,020	21,662
Adjusted R^2	0.254	0.244	0.231	0.230	0.220	0.215	0.269	0.273	0.280

Panel B	Dependent variable=Future_vol_day								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
Tax	-0.006***	-0.002**	-0.002***	0.000	-0.000	0.001***	0.000	-0.097***	-0.017*
	(-6.24)	(-2.24)	(-3.70)	(0.34)	(-0.38)	(5.14)	(0.86)	(-4.22)	(-1.79)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,304	40,715	51,948	53,072	60,994	49,111	22,446	23,042	21,674

Adjusted R^2	0.400	0.381	0.364	0.361	0.345	0.336	0.382	0.383	0.475

This table examines the association between tax avoidance and firm risk using the following model:

$$\text{Future Return Volatility}_{t+1} = \beta_0 + \beta_1 \text{TAX}_{it} + \beta_3 \text{PTBI}_{it} + \beta_4 \text{Vol\_PTBI}_{it} + \beta_5 \text{BTM}_{it} + \beta_6 \text{Leverage}_{it} + \beta_7 \text{Size}_{it} + \beta_8 \text{Abn\_Accruals}_{it} + \beta_9 \text{Return}_{it} + \beta_{10} \text{Inst\_Own}_{it} + \beta_{11} \text{Shares\_Out}_{it} + \beta_{12} \text{VolSpecialItems}_{it} + \beta_{13} \text{Vol\_CashFlow}_{it} + \beta_{14} \text{Vol\_ETBSO}_{it} + \beta_{15} \text{ETBSO}_{it} + \beta_{16} \text{CHG\_NOLCF}_{it} + \beta_{17} \text{NOLCF}_{it} + \beta_{18} \text{Loss}_{it} + \varepsilon_{it}$$

where Future Return Volatility is the standard deviation of monthly stock returns computed over the following year; and TAX is the measure of tax avoidance. ε is the error term. All variables are defined in the Appendix. Figures in parentheses are t-statistics. *** (**, *) indicates significant at the 1% (5%, 10%) level for two-tailed test.

Table 3 (continued)

Panel C, D and E: The inclusion of current period return volatility

Panel C	Dependent variable= Future_vol_trt1m								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
Tax	-0.018***	-0.003	-0.006**	0.005*	0.000	0.004***	-0.003*	-0.334***	-0.028
	(-4.20)	(-0.54)	(-2.33)	(1.65)	(0.43)	(5.56)	(-1.90)	(-2.86)	(-0.47)
Current_vol_trt1m	0.108***	0.111***	0.121***	0.123***	0.118***	0.022**	0.068***	0.070***	-0.006
	(6.49)	(7.27)	(9.60)	(10.03)	(11.53)	(1.97)	(2.80)	(3.00)	(-0.48)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39,249	42,782	54,869	56,060	64,520	53,169	23,815	24,468	22,835
Adjusted R^2	0.252	0.244	0.230	0.230	0.218	0.202	0.259	0.262	0.261

Panel D	Dependent variable=Future_vol_12month								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
Tax	-0.018***	0.000	-0.007***	0.004	-0.001	0.003***	-0.002	-0.381***	-0.069
	(-4.50)	(0.06)	(-2.74)	(1.40)	(-1.07)	(4.17)	(-1.39)	(-3.36)	(-1.27)
Current_vol_12month	0.111***	0.112***	0.126***	0.126***	0.119***	0.065***	0.110***	0.115***	-0.006
	(6.61)	(7.16)	(9.62)	(9.78)	(11.16)	(5.75)	(6.95)	(7.59)	(-0.59)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,294	40,704	51,923	53,046	60,962	49,046	22,419	23,013	21,654
Adjusted R^2	0.264	0.255	0.244	0.243	0.233	0.221	0.280	0.286	0.280

Panel E	Dependent variable=Future_vol_day								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
Tax	-0.003***	-0.001	-0.001**	0.001	-0.000	0.000***	0.000	-0.068***	-0.016*
	(-4.67)	(-1.22)	(-1.98)	(1.51)	(-1.35)	(2.93)	(0.64)	(-3.69)	(-1.75)
Current_vol_day	0.341***	0.346***	0.333***	0.337***	0.316***	0.245***	0.311***	0.324***	0.118***
	(27.69)	(16.51)	(11.17)	(11.53)	(12.92)	(12.11)	(16.51)	(18.33)	(7.96)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,302	40,712	51,936	53,060	60,981	49,097	22,445	23,039	21,669
Adjusted R^2	0.463	0.451	0.437	0.436	0.420	0.390	0.444	0.449	0.484

This table examines the association between tax avoidance and firm risk using the following model:

$$\text{Future Return Volatility}_{t+1} = \beta_0 + \beta_1 \text{TAX}_{it} + \beta_3 \text{PTBI}_{it} + \beta_4 \text{Vol\_PTBI}_{it} + \beta_5 \text{BTM}_{it} + \beta_6 \text{Leverage}_{it} + \beta_7 \text{Size}_{it} + \beta_8 \text{Abn\_Accruals}_{it} + \beta_9 \text{Return}_{it} + \beta_{10} \text{Inst\_Own}_{it} + \beta_{11} \text{Shares\_Out}_{it} + \beta_{12} \text{VolSpecialItems}_{it} + \beta_{13} \text{Vol\_CashFlow}_{it} + \beta_{14} \text{Vol\_ETBSO}_{it} + \beta_{15} \text{ETBSO}_{it} + \beta_{16} \text{CHG\_NOLCF}_{it} + \beta_{17} \text{NOLCF}_{it} + \beta_{18} \text{Loss}_{it} + \varepsilon_{it}$$

where Future Return Volatility is the standard deviation of monthly stock returns computed over the following year; and TAX is the measure of tax avoidance. ε is the error term. All variables are defined in the Appendix. Figures in parentheses are t-statistics. *** (**, *) indicates significant at the 1% (5%, 10%) level for two-tailed test.

Table 3 (continued): Alternative fixed effect

Panel F, G and H: The use of industry and year fixed effects

Panel F	Dependent variable= Future_vol_trt1m								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
Tax	-0.028***	-0.008**	-0.019***	-0.004	0.001*	0.003***	-0.002*	-0.090	-0.021
	(-10.73)	(-2.43)	(-9.08)	(-1.52)	(1.85)	(4.25)	(-1.80)	(-1.25)	(-0.65)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	39,249	42,782	54,869	56,062	64,520	53,174	23,816	24,469	22,836
Adjusted R^2	0.358	0.358	0.354	0.354	0.351	0.385	0.428	0.428	0.414

Panel G	Dependent variable=Future_vol_12month								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
Tax	-0.028***	-0.008**	-0.019***	-0.005**	0.000	0.003***	-0.003**	-0.136**	-0.029
	(-11.23)	(-2.56)	(-9.79)	(-2.38)	(0.71)	(4.24)	(-2.57)	(-2.00)	(-0.95)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,298	40,709	51,940	53,064	60,983	49,065	22,424	23,020	21,662
Adjusted R^2	0.369	0.368	0.367	0.367	0.366	0.391	0.440	0.439	0.427

Panel H	Dependent variable=Future_vol_day								
VARIABLES	(1) 5-Year Cash ETR	(2) 5-Year GAAP ETR	(3) 3-Year Adjusted Cash ETR	(4) 3-Year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX	(7) Shelter	(8) Predicted UTB	(9) Reported UTB
Tax	-0.007***	-0.003***	-0.004***	-0.001**	0.000	0.001***	0.002***	-0.041***	-0.018***
	(-13.86)	(-4.58)	(-9.59)	(-2.21)	(1.54)	(3.40)	(9.05)	(-2.95)	(-3.11)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,304	40,715	51,948	53,072	60,994	49,111	22,446	23,042	21,674
Adjusted R^2	0.512	0.508	0.513	0.513	0.517	0.538	0.566	0.566	0.594

This table examines the association between tax avoidance and firm risk using the following model:

Future Return Volatility$_{t+1}$= β_0+ β_1 TAX$_{it}$+ β_3 PTBI$_{it}$ +β_4 Vol_PTBI$_{it}$+ β_5 BTM$_{it}$+ β_6 Leverage$_{it}$+ β_7 Size$_{it}$ + β_8 Abn_Accruals$_{it}$+ β_9 Return$_{it}$+ β_{10} Inst_Own$_{it}$ + β_{11} Shares_Out$_{it}$+ β_{12} VolSpecialItems$_{it}$+ β_{13} Vol_CashFlow$_{it}$+ β_{14} Vol_ETBSO$_{it}$+ β_{15} ETBSO$_{it}$+ β_{16} CHG_NOLCF$_{it}$+ β_{17} NOLCF$_{it}$+ β_{18} Loss$_{it}$+ ε_{it}

where Future Return Volatility is the standard deviation of monthly stock returns computed over the following year; and TAX is the measure of tax avoidance. ε is the error term. All variables are defined in the Appendix. Figures in parentheses are t-statistics. *** (**, *) indicates significant at the 1% (5%, 10%) level for two-tailed test.

Table 4 The Relation between Tax Avoidance and Firm Risk: China firms

VARIABLES	(1) 5-year Cash ETR	(2) 5-year GAAP ETR	(3) 3-year Adjusted Cash ETR	(4) 3-year Adjusted GAAP ETR	(5) Cash ETR Volatility	(6) DTAX
TAX	0.008**	0.012***	0.008***	0.011***	0.000	-0.011
	(2.00)	(2.85)	(2.72)	(3.48)	(0.72)	(-1.26)
PTBI	-0.021***	-0.026***	-0.024***	-0.025***	-0.028***	-0.037***
	(-2.78)	(-3.50)	(-3.18)	(-3.40)	(-2.98)	(-4.09)
Vol_PTBI	-0.008	-0.009	-0.010	-0.009	-0.013	0.002
	(-1.03)	(-1.23)	(-1.38)	(-1.26)	(-1.41)	(0.22)
BTM	0.006***	0.003***	0.003***	0.003***	0.003***	0.002**
	(3.84)	(3.63)	(3.57)	(3.60)	(3.31)	(2.46)
Leverage	0.008***	0.007***	0.007***	0.007***	0.009***	0.009***
	(3.12)	(3.06)	(2.98)	(3.04)	(3.37)	(3.82)
Size	-0.007***	-0.007***	-0.006***	-0.007***	-0.006***	-0.008***
	(-4.72)	(-4.64)	(-4.37)	(-4.59)	(-3.81)	(-5.68)
Abn_Accruals	-0.001	0.000	-0.000	0.000	0.001	-0.001
	(-0.33)	(0.05)	(-0.07)	(0.04)	(0.20)	(-0.56)
Return	0.005***	0.005***	0.005***	0.005***	0.004***	0.004***
	(6.27)	(5.89)	(5.91)	(5.88)	(4.11)	(3.99)
Inst_Own	0.000**	0.000**	0.000**	0.000**	0.000**	0.000***
	(2.43)	(2.10)	(1.97)	(2.13)	(2.33)	(3.84)
Share_Out	-0.005***	-0.006***	-0.006***	-0.006***	-0.007***	-0.006***
	(-4.10)	(-5.21)	(-5.25)	(-5.24)	(-5.08)	(-4.78)
Vol_SpecialItems	-0.036	-0.038*	-0.035	-0.038*	-0.024	-0.023
	(-1.53)	(-1.69)	(-1.56)	(-1.67)	(-0.92)	(-1.03)
Vol_CashFlow	0.013*	0.015**	0.015**	0.016**	0.014*	0.007
	(1.93)	(2.20)	(2.25)	(2.28)	(1.79)	(0.94)
NOLCF	0.087	0.123	0.133	0.118	0.055	-0.192
	(0.38)	(0.55)	(0.58)	(0.53)	(0.21)	(-0.99)
CHG_NOLCF	-0.036	-0.042	-0.078	-0.058	-0.029	-0.340
	(-0.11)	(-0.14)	(-0.25)	(-0.19)	(-0.08)	(-1.29)
Loss	0.024**	0.025**	0.024**	0.024**	0.022**	0.005***
	(2.27)	(2.28)	(2.26)	(2.25)	(1.97)	(3.07)
Contant	0.335***	0.336***	0.333***	0.338***	0.335***	0.387***
	(11.80)	(12.15)	(11.90)	(12.17)	(10.94)	(14.94)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,867	15,229	15,135	15, 942	14,087	17,545
Adjusted R^2	0.443	0.442	0.443	0.442	0.425	0.391

This table examines the association between tax avoidance and firm risk using the following model:

$$\text{Future Return Volatility}_{t+1} = \beta_0 + \beta_1 \text{TAX}_{it} + \beta_3 \text{PTBI}_{it} + \beta_4 \text{Vol\_PTBI}_{it} + \beta_5 \text{BTM}_{it} + \beta_6 \text{Leverage}_{it} + \beta_7 \text{Size}_{it} + \beta_8 \text{Abn\_Accruals}_{it} + \beta_9 \text{Return}_{it} + \beta_{10} \text{Inst\_Own}_{it} + \beta_{11} \text{Shares\_Out}_{it} + \beta_{12} \text{VolSpecialItems}_{it} + \beta_{13} \text{Vol\_CashFlow}_{it} + \beta_{14} \text{Vol\_ETBSO}_{it} + \beta_{15} \text{ETBSO}_{it} + \beta_{16} \text{CHG\_NOLCF}_{it} + \beta_{17} \text{NOLCF}_{it} + \beta_{18} \text{Loss}_{it} + \varepsilon_{it}$$

where Future Return Volatility is the standard deviation of monthly stock returns computed over the following year; and TAX is the measure of tax avoidance. ε is the error term. All variables are defined in the Appendix. Figures in parentheses are t-statistics. *** (**, *) indicates significant at the 1% (5%, 10%) level for two-tailed test.

Table 5 The Relation between Tax Avoidance and Firm Risk: State-owned enterprises in China

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	5-year Cash ETR	5-year Cash ETR	5-year GAAP ETR	5-year GAAP ETR	3-year Adjusted Cash ETR	3-year Adjusted Cash ETR
	SOE	Non-SOE	SOE	Non-SOE	SOE	Non-SOE
TAX	0.016***	-0.001	0.018***	0.007	0.015***	0.000
	(3.15)	(-0.19)	(3.21)	(1.18)	(3.79)	(0.06)
PTBI	-0.009	-0.034***	-0.014	-0.039***	-0.009	-0.038***
	(-0.88)	(-3.21)	(-1.34)	(-3.74)	(-0.90)	(-3.70)
Vol_PTBI	-0.016	0.005	-0.013	0.001	-0.014	-0.000
	(-1.50)	(0.49)	(-1.29)	(0.08)	(-1.38)	(-0.04)
BTM	0.005***	0.008***	0.002***	0.006***	0.002***	0.006***
	(2.84)	(3.07)	(2.86)	(3.19)	(2.80)	(3.27)
Leverage	0.010***	0.006*	0.010***	0.006	0.010***	0.006
	(3.53)	(1.67)	(3.40)	(1.60)	(3.29)	(1.64)
Size	-0.010***	-0.007***	-0.009***	-0.007***	-0.009***	-0.007***
	(-4.69)	(-2.93)	(-4.62)	(-2.99)	(-4.39)	(-2.92)
Abn_Accruals	-0.002	0.000	-0.000	0.001	-0.001	0.000
	(-0.45)	(0.01)	(-0.10)	(0.18)	(-0.15)	(0.02)
Return	0.007***	0.005***	0.006***	0.005***	0.007***	0.005***
	(5.40)	(4.13)	(5.26)	(3.81)	(5.34)	(3.79)
Inst_Own	0.000	0.000***	0.000	0.000***	0.000	0.000***
	(0.76)	(2.66)	(0.23)	(2.83)	(0.08)	(2.79)
Share_Out	-0.005***	-0.005***	-0.006***	-0.006***	-0.006***	-0.006***
	(-2.86)	(-2.81)	(-3.80)	(-3.20)	(-3.80)	(-3.22)
Vol_SpecialItems	-0.019	-0.064**	-0.030	-0.063*	-0.026	-0.058*
	(-0.61)	(-1.98)	(-0.99)	(-1.94)	(-0.87)	(-1.80)
Vol_CashFlow	0.019**	0.003	0.020**	0.007	0.019**	0.007
	(2.05)	(0.26)	(2.12)	(0.71)	(2.09)	(0.72)
NOLCF	-0.056	0.250	0.046	0.264	-0.001	0.339
	(-0.16)	(0.79)	(0.14)	(0.84)	(-0.00)	(1.08)
CHG_NOLCF	-0.424	0.119	-0.386	0.026	-0.443	-0.002
	(-0.89)	(0.27)	(-0.89)	(0.06)	(-0.98)	(-0.00)
Loss	0.018	0.036***	0.019	0.036***	0.018	0.036***
	(1.03)	(2.72)	(1.09)	(2.74)	(1.01)	(2.73)
Constant	0.373***	0.350***	0.369***	0.352***	0.367***	0.353***
	(9.47)	(8.20)	(9.60)	(8.55)	(9.36)	(8.43)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7501	7366	7671	7558	7620	7515

Adjusted R^2	0.417	0.484	0.414	0.485	0.416	0.486

Table 5 (continued)

VARIABLES	(7) 3-year Adjusted GAAP ETR	(8) 3-year Adjusted GAAP ETR	(9) Cash ETR Volatility	(10) Cash ETR Volatility	(11) DTAX	(12) DTAX
	SOE	Non-SOE	SOE	Non-SOE	SOE	Non-SOE
TAX	0.014***	0.009*	0.001	-0.000	-0.002	-0.010
	(3.33)	(1.94)	(1.56)	(-0.47)	(-0.18)	(-0.87)
PTBI	-0.013	-0.038***	-0.008	-0.049***	-0.015	-0.050***
	(-1.29)	(-3.66)	(-0.66)	(-3.70)	(-1.23)	(-3.99)
Vol_PTBI	-0.013	0.001	-0.024**	0.003	-0.015	0.016
	(-1.33)	(0.07)	(-1.98)	(0.26)	(-1.09)	(1.15)
BTM	0.002***	0.006***	0.003***	0.006***	0.002**	0.003*
	(2.86)	(3.17)	(2.87)	(2.90)	(2.05)	(1.88)
Leverage	0.010***	0.006	0.012***	0.007*	0.012***	0.004
	(3.40)	(1.59)	(3.51)	(1.73)	(4.20)	(1.20)
Size	-0.009***	-0.007***	-0.008***	-0.006**	-0.010***	-0.006***
	(-4.60)	(-2.93)	(-3.96)	(-2.40)	(-5.50)	(-3.06)
Abn_Accruals	-0.001	0.001	-0.002	0.002	-0.004	-0.001
	(-0.20)	(0.21)	(-0.39)	(0.48)	(-1.11)	(-0.26)
Return	0.006***	0.005***	0.006***	0.005***	0.006***	0.004***
	(5.28)	(3.80)	(3.63)	(3.22)	(4.11)	(2.79)
Inst_Own	0.000	0.000***	0.000	0.000***	0.000	0.000***
	(0.24)	(2.85)	(0.36)	(3.26)	(1.49)	(3.77)
Share_Out	-0.006***	-0.006***	-0.006***	-0.006***	-0.007***	-0.005***
	(-3.82)	(-3.21)	(-3.59)	(-3.31)	(-4.37)	(-2.90)
Vol_SpecialItems	-0.026	-0.064**	-0.002	-0.055	0.002	-0.046
	(-0.88)	(-1.97)	(-0.06)	(-1.47)	(0.06)	(-1.45)
Vol_CashFlow	0.020**	0.008	0.023**	-0.000	0.013	-0.000
	(2.13)	(0.76)	(2.35)	(-0.03)	(1.19)	(-0.04)
NOLCF	0.058	0.241	-0.193	0.319	-0.098	-0.224
	(0.18)	(0.76)	(-0.48)	(0.92)	(-0.36)	(-0.81)
CHG_NOLCF	-0.434	0.028	-0.306	0.091	-0.335	-0.317
	(-1.00)	(0.07)	(-0.59)	(0.19)	(-0.91)	(-0.87)
Loss	0.017	0.036***	0.019	0.032**	0.005*	0.006**
	(1.01)	(2.75)	(1.14)	(2.29)	(1.93)	(2.40)
Constant	0.373***	0.351***	0.364***	0.353***	0.451***	0.352***
	(9.63)	(8.52)	(8.77)	(7.66)	(12.24)	(9.42)
Firm Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8027	7915	6950	7137	8648	8897
Adjusted R^2	0.414	0.485	0.375	0.483	0.339	0.451

This table examines the association between tax avoidance and firm risk using the following model:

$$\text{Future Return Volatility}_{t+1} = \beta_0 + \beta_1 \text{TAX}_{it} + \beta_3 \text{PTBI}_{it} + \beta_4 \text{Vol\_PTBI}_{it} + \beta_5 \text{BTM}_{it} + \beta_6 \text{Leverage}_{it} + \beta_7 \text{Size}_{it} + \beta_8 \text{Abn\_Accruals}_{it} + \beta_9 \text{Return}_{it} + \beta_{10} \text{Inst\_Own}_{it} + \beta_{11} \text{Shares\_Out}_{it} + \beta_{12} \text{VolSpecialItems}_{it} + \beta_{13} \text{Vol\_CashFlow}_{it} + \beta_{14} \text{Vol\_ETBSO}_{it} + \beta_{15} \text{ETBSO}_{it} + \beta_{16} \text{CHG\_NOLCF}_{it} + \beta_{17} \text{NOLCF}_{it} + \beta_{18} \text{Loss}_{it} + \varepsilon_{it}$$

where Future Return Volatility is the standard deviation of monthly stock returns computed over the following year; and TAX is the measure of tax avoidance. ε is the error term. All variables are defined in the Appendix. Figures in parentheses are t-statistics. *** (**, *) indicates significant at the 1% (5%, 10%) level for two-tailed test.

Table 6 The Relation between Tax Avoidance and Firm Risk: Difference in differences analysis

Panel A: The relation between tax avoidance and firm risk in China around the initial introduction of GAAR in 2008 (excluding 2008 and 2009)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	5-year Cash ETR	5-year GAAP ETR	3-year Adjusted Cash ETR	3-year Adjusted GAAP ETR	Cash ETR Volatility
TAX	-0.007	-0.007	-0.002	-0.006	0.009**
	(-0.68)	(-0.68)	(-0.24)	(-0.65)	(2.53)
Post	-0.068***	-0.068***	-0.062***	-0.061***	-0.080***
	(-7.08)	(-7.15)	(-6.70)	(-6.79)	(-8.05)
Post× TAX	0.022	0.026*	0.009	0.008	-0.008**
	(1.49)	(1.87)	(0.61)	(0.61)	(-2.30)
PTBI	0.014	0.012	0.013	0.012	-0.018
	(0.89)	(0.76)	(0.85)	(0.79)	(-0.74)
Vol_PTBI	-0.068*	-0.065*	-0.066*	-0.067*	-0.056
	(-1.81)	(-1.77)	(-1.78)	(-1.83)	(-1.46)
BTM	0.005*	0.005**	0.005**	0.005**	0.006**
	(1.65)	(2.30)	(2.25)	(2.28)	(1.99)
Leverage	0.011**	0.011**	0.011**	0.011**	0.017**
	(2.08)	(2.04)	(2.03)	(2.03)	(2.54)
Size	-0.004	-0.004	-0.004	-0.004	0.003
	(-0.93)	(-0.91)	(-0.86)	(-0.88)	(0.48)
Abn_Accruals	-0.000	0.001	0.001	0.001	0.002
	(-0.00)	(0.24)	(0.14)	(0.18)	(0.21)
Return	0.004**	0.005***	0.005***	0.005***	-0.005*
	(2.48)	(2.59)	(2.65)	(2.60)	(-1.67)
Inst_Own	0.000	0.000	0.000	0.000	0.000*
	(0.94)	(0.25)	(0.21)	(0.16)	(1.68)
Share_Out	-0.003	-0.003	-0.003	-0.003	-0.004
	(-0.92)	(-1.12)	(-1.13)	(-1.21)	(-1.11)
Vol_SpecialItems	-0.081	-0.087	-0.085	-0.089	-0.099
	(-1.03)	(-1.13)	(-1.07)	(-1.13)	(-1.42)
Vol_CashFlow	0.054**	0.046*	0.048*	0.048*	0.070
	(1.99)	(1.73)	(1.80)	(1.83)	(1.55)
NOLCF	-0.947	-0.312	-0.263	-0.294	-1.467
	(-1.14)	(-0.36)	(-0.30)	(-0.34)	(-1.11)
CHG_NOLCF	0.924	0.370	0.376	0.446	1.163
	(1.02)	(0.44)	(0.44)	(0.53)	(0.95)
Loss	0.016	0.016	0.017	0.017	-0.023
	(0.57)	(0.56)	(0.60)	(0.62)	(-0.85)
Constant	0.301***	0.303***	0.296***	0.301***	0.166

	(3.48)	(3.49)	(3.44)	(3.47)	(1.37)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	2,716	2,751	2,746	2,751	2,098
Adjusted R^2	0.620	0.617	0.616	0.616	0.380

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Table 6 (continued)

Panel B: The relation between tax avoidance and firm risk in China around the Administrative Measures for the GAAR in 2015 (excluding 2014 and 2015)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	5-year Cash ETR	5-year GAAP ETR	3-year Adjusted Cash ETR	3-year Adjusted GAAP ETR	Cash ETR Volatility	DTAX
TAX	0.004	0.007	0.016*	0.019**	-0.004***	0.021
	(0.41)	(0.65)	(1.85)	(2.13)	(-2.59)	(0.85)
Post	-0.017***	-0.018***	-0.015***	-0.015***	-0.017***	-0.011***
	(-4.33)	(-4.64)	(-5.55)	(-5.52)	(-6.02)	(-4.80)
Post× TAX	0.009	0.011	-0.007	-0.002	0.004***	-0.002
	(0.84)	(1.06)	(-0.74)	(-0.207)	(2.59)	(-0.08)
PTBI	-0.022	-0.031**	-0.027*	-0.029*	-0.039**	-0.057***
	(-1.38)	(-1.99)	(-1.69)	(-1.88)	(-2.05)	(-3.38)
Vol_PTBI	-0.004	0.001	0.001	0.000	-0.000	0.015
	(-0.37)	(0.08)	(0.09)	(0.01)	(-0.00)	(0.90)
BTM	0.008**	0.004*	0.004*	0.004*	0.004	0.003*
	(2.43)	(1.93)	(1.82)	(1.92)	(1.56)	(1.85)
Leverage	0.006	0.006	0.006	0.006	0.009*	0.005
	(1.24)	(1.27)	(1.29)	(1.24)	(1.80)	(1.13)
Size	-0.008**	-0.008**	-0.007**	-0.007**	-0.007**	-0.008***
	(-2.44)	(-2.50)	(-2.23)	(-2.48)	(-2.34)	(-3.38)
Abn_Accruals	-0.013**	-0.013**	-0.013**	-0.013**	-0.011**	-0.010**
	(-2.55)	(-2.57)	(-2.54)	(-2.50)	(-1.99)	(-2.18)
Return	-0.001	-0.002	-0.002	-0.002	-0.001	-0.002
	(-0.39)	(-0.65)	(-0.84)	(-0.69)	(-0.53)	(-0.98)
Inst_Own	0.000	0.000*	0.000*	0.000**	0.000	0.000**
	(1.52)	(1.73)	(1.86)	(2.04)	(1.248)	(2.50)
Share_Out	-0.001	-0.002	-0.003	-0.003	-0.003	-0.003
	(-0.51)	(-0.94)	(-1.19)	(-1.06)	(-0.99)	(-1.25)
Vol_SpecialItems	0.032	0.024	0.027	0.027	0.037	0.032
	(0.87)	(0.66)	(0.75)	(0.74)	(0.92)	(0.87)
Vol_CashFlow	-0.003	-0.003	-0.005	-0.002	-0.007	-0.012
	(-0.21)	(-0.26)	(-0.36)	(-0.18)	(-0.50)	(-0.81)
NOLCF	0.239	0.367	0.336	0.354	0.174	0.106
	(0.54)	(0.86)	(0.76)	(0.82)	(0.38)	(0.31)
CHG_NOLCF	-0.774	-0.662	-0.749	-0.694	-1.007*	-1.212***
	(-1.40)	(-1.23)	(-1.37)	(-1.29)	(-1.76)	(-2.89)
Loss	0.003	0.007	0.007	0.007	0.002	0.006**
	(0.34)	(0.74)	(0.70)	(0.67)	(0.24)	(1.98)
Constant	0.307***	0.313***	0.307***	0.317***	0.316***	0.340***
	(4.99)	(5.37)	(5.25)	(5.48)	(5.31)	(7.00)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,859	6,017	5,970	6,017	5,793	7,235
Adjusted R^2	0.135	0.131	0.133	0.132	0.137	0.114

This table examines the association between tax avoidance and firm risk using the following model:

Future Return Volatility$_{t+1}$ = β_0 + β_1 TAX$_{it}$ + β_2 Post$_{it}$ + β_3Post$_{it}$×Tax$_{it}$ + β_4 PTBI$_{it}$ + β_5 Vol_PTBI$_{it}$ + β_6 BTM$_{it}$ + β_7 Leverage$_{it}$ + β_8 Size$_{it}$ + β_9 Abn_Accruals$_{it}$ + β_{10} Return$_{it}$ + β_{11} Inst_Own$_{it}$ + β_{12} Shares_Out$_{it}$ + β_{13} VolSpecialItems$_{it}$ + β_{14} Vol_CashFlow$_{it}$ + β_{15} Vol_ETBSO$_{it}$ + β_{16} ETBSO$_{it}$ + β_{17} CHG_NOLCF$_{it}$ + β_{18} NOLCF$_{it}$ + β_{19} Loss$_{it}$ + ε_{it}

where Future Return Volatility is the standard deviation of monthly stock returns computed over the following year; TAX is a measure of tax avoidance; Post is an indicator variable taking the value of one for firm years after 2008 in accordance with the introduction of the GAAR (or after 2015 for the Administrative Measures for the GAAR), and zero otherwise. All variables are defined in the Appendix. Figures in parentheses are t-statistics. *** (**, *) indicates significant at the 1% (5%, 10%) level for two-tailed test.