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The effect of the interplay between corporate governance and external monitoring regimes on firms' tax avoidance

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ABSTRACT

This study investigates how the interplay between internal corporate governance and the changes in the tax and corporate governance environment in the U.S. during the early 2000s affected firms' tax avoidance levels. Analyses use a panel of U.S. firms for the period 1997–2005 and permanent book-tax difference and cash effective tax rates as proxies for tax avoidance. Results suggest that, relative to other firms, firms with weak-governance during the low-regulation period (years 1997–2000) exhibited lower tax-avoidance levels during the high-regulation period (years 2003–2005) in response to the tighter external monitoring regime. The study adds to the corporate tax avoidance literature by providing evidence regarding the importance of considering external monitoring regimes in the study of the relationship between corporate governance and tax avoidance.

1. Introduction

Corporate scandals and general public concerns led to increased external monitoring activity by tax and financial reporting authorities in the early 2000s. Such increased monitoring was a response to a suspected increase in tax avoidance activities (U.S. Treasury, 1999) and a deterioration of corporate governance institutions (Coffee, 2006).[2] Specifically, the IRS increased both reporting requirements and audit activity in an effort to reduce tax avoidance and Congress empowered the SEC, through the Sarbanes-Oxley Act of 2002 (SOX), to increase internal control requirements for publically traded firms.

In this paper, I provide evidence regarding whether tax avoidance did in fact decrease following the changes in external monitoring. Furthermore, I examine whether firms with weaker corporate governance in the 1990s exhibited lower tax avoidance levels than other firms after the regulatory regime changed.[3] Such weaker corporate governance firms were probably affected to a greater extent than other firms by regulatory regime changes because they were most likely to have weaknesses in their internal controls (Hoitash, Hoitash, & Bedard, 2009; Krishnan, 2005). Therefore, they may have invested resources to improve their internal controls and eliminated certain risks from their tax avoidance activities (KPMG, 2006) that would result in lower tax avoidance levels relative to other firms. My study extends and contributes to our understanding of the interplay between external and internal corporate governance mechanisms on corporate tax avoidance and it is of interest to regulators and academics.

I define *tax avoidance* as a reduction on a corporation's explicit taxes that do not distinguish between real activities undertaken to reduce tax liabilities and targeted tax benefits from lobbying activities (Dyreng, Hanlon, & Maydew, 2008; Hanlon & Heitzman, 2010) nor from those activities that are considered outright illegal tax evasion. This definition fits the context of my study because the effect of increased regulation throughout this period affected areas of tax reporting that transcended tax sheltering activities.

In my analyses, I use estimated permanent book-tax differences and cash effective tax rates (ETR) to measure firms' tax avoidance levels. I implement a difference-in-differences design on an unbalanced panel of large U.S. firms for the period from 1997 to 2005 using fixed-effects

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[2] Examples of corporate governance institutions are independent auditors, investment bankers, and credit rating agencies, which Coffee (2006) identifies as gatekeepers or reputational intermediaries who assure investors about the quality of the "signal" sent by a corporation.

[3] I use the terms regulatory regime changes and external monitoring changes to refer to the combination of tax regulation changes and corporate governance reform that occurred during the early 2000s.

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regressions. To implement the difference-in-differences design and test the effect of regulation changes on firms' tax avoidance levels, I create a discontinuity in the time series by eliminating years 2001–2002 (transition period) from the sample. The sample partition including years 1997–2000 (low-regulation period) captures the period where aggressive tax avoidance activity was booming and most of the high-profile accounting scandals (e.g., Enron, WorldCom) were underway but undetected. The sample partition including years 2003–2005 (high-regulation period) captures the period where the IRS re-focused its efforts to curb aggressive tax reporting and the initiation of the SOX disclosure requirements. Then, I use firms' governance strength during the late 1990s to test the effect of the regulatory regime changes in tax avoidance.

I document that tax avoidance did not, on average, decrease in response to the external regulatory environment changes of the early 2000s, suggesting that firms continued pursuing their tax avoidance strategies because the benefits from pursuing those strategies were greater than the perceived tax compliance costs and detection risks after the external regime change. However, the results indicate lower permanent book-tax differences and higher cash ETRs (*both indicative of reduced tax avoidance*) during the high-regulation period for firms identified as weakly governed prior to the external monitoring changes relative to other firms. The evidence suggests that managers of weakly governed firms may have employed tax avoidance strategies that were not sustainable under the new environment and/or that the efforts to improve their internal controls took resources away from tax planning activities, which resulted in lower tax avoidance levels for such firms. The results are also consistent with managers of weakly governed firms using tax avoidance strategies to achieve short-term profitability goals that became riskier under the tighter external monitoring environment thereby inducing a reduction in their firms' tax avoidance levels.

I contribute to the literature that investigates the relationship between tax avoidance and corporate governance. Earlier evidence in this research stream finds mixed results. For example, several studies document a positive association between tax avoidance and weak corporate governance (e.g., Desai & Dharmapala, 2006; Desai, Dyck, & Zingales, 2007; Lanis & Richardson, 2011, 2012). However, other studies suggest there are alternative explanations for the association between corporate governance and tax avoidance (e.g., Armstrong, Blouin, Jagolinzer, & Larcker, 2015; Seidman & Stomberg, 2017) while others find no association between corporate governance and tax avoidance (Blaylock, 2016). My results indicate a reduction in tax avoidance in the high-regulation period for firms that had weak corporate governance structures in the low-regulation period, providing support for the conclusion of a positive association between tax avoidance and weak corporate governance that depends on the external monitoring environment.

In addition, the analyses in this study are based on a comprehensive corporate governance score that aims to capture the overall strength of firms' corporate governance, which is consistent with the concept that firms' corporate governance requires a combination of both internal and external measures (Brown & Caylor, 2006; Cremers & Nair, 2005). In contrast, many studies in this research area (e.g., Armstrong et al., 2015; Blaylock, 2016; Minnick & Noga, 2010; Seidman & Stomberg, 2017) use single or disaggregated corporate governance measures (e.g., number of independent directors, shareholders' rights protection index) that cannot capture the overall strength and complexity of a firm's corporate governance.

The study complements Desai et al. (2007) by examining the effect of the interplay between the tax environment and corporate governance on tax avoidance in a large sample of U.S. firms. In contrast, Desai et al. study a small sample of Russian firms and a panel of country level (macro) data, documenting results that may not generalize to U.S. firms. For instance, the changes in the U.S. regulatory environment were a combination of administrative and enforcement actions while Desai et al. (2007) primarily studied tax regulatory interventions directed to curb what would be considered outright criminal behavior. My research indicates the importance of considering firms' internal corporate governance as well as their external governance mechanisms in the analysis of corporate tax avoidance.

This study is different from Hoopes, Mescall, and Pittman (2012)—who link increased IRS audit probability to reductions in tax avoidance—in that I focus on the cross-sectional differences in tax avoidance before and after the regulatory changes specific to the early 2000s and condition my analysis on firms' corporate governance strength before the changes took place. I also find some evidence indicating that, for my sample period, the shock to the tax and corporate governance regimes combined with an improvement in firm's corporate governance helps explaining the lower levels of tax avoidance relative to other firms.

The next section discusses the background and the third section develops the hypothesis. The fourth section describes the research design followed by the results section. The last section presents concluding remarks and discusses limitations of the study.

2. Background

2.1. External monitoring environment in the late 1990s

During the late 1990s, the U.S. Treasury and other stakeholders raised concerns regarding the growth in aggressive corporate tax avoidance. The U.S. Treasury (1999) reported an increase in corporations' tax avoidance activities that stressed the IRS's revenue collection efforts and undermined the public's perception of the tax system. The General Accounting Office (GAO) reported that the percentage of large U.S.-controlled corporations reporting no tax liabilities increased from 29.1% in 1996 to 37.5% in 2000 (GAO, 2004) consistent with the increased use of tax avoidance strategies throughout the late 1990s.

Findings from academic research suggest an increase in the gap between financial statement and taxable income during the 1990s that is oftentimes interpreted as an increase in corporate tax avoidance. Desai (2003) documents a decrease in the correlation between financial statement and estimated taxable income during the 1990s that cannot be explained exclusively earnings management and/or stock option deductions. Desai advances an increase in tax sheltering (an extreme form of tax avoidance) as an explanation. Plesko (2007) analyzes tax return data and finds evidence indicating corporate managers can undertake tax-reducing activities that have little impact on their financial statement income, which may partially explain the book-tax gap.

Crenshaw (1999) attributes the increase in tax avoidance during the late 1990s to the weakness of IRS enforcement efforts, corporate greed, and the wide availability of tax planning products in the market. Consistent with Crenshaw's argument, data from the Transactional Records Access Clearinghouse (TRAC, 2014) indicate a steady decrease in the audit rates across all business sizes during this period. For example, audit rates for the largest corporations (i.e., with $250 million assets or more) declined from 46% in 1997 to 31% in 2000.

Crenshaw (1999) also argued that during the late 1990s corporate management saw managing taxes as new way of maximizing profits and cash flow, which is supported by anecdotal evidence indicating that during the 1990s some firms began to use profit centers as the performance measurement model for tax departments (Robinson, Sikes, & Weaver, 2010). Consistent with Crenshaw's argument the Joint Committee on Taxation's investigation of Enron found that Enron used complex tax structures to increase their financial statement income while simultaneously reducing the income they reported to the IRS.[4]

Alongside regulators' claims about aggressive tax planning, the

[4] See Joint Committee on Taxation, 2003 Report of Investigation of Enron Corporation and Related Entities. Regarding Federal Tax and Compensation Issues, and Policy Recommendations (JCS-3-03), February 2003, Vol. 1.

general state of corporate governance institutions was unraveling. Coffee (2002) argues that during the late 1990s there was an overall failure of the stock market's gatekeepers to perform their duties that resulted in the securities fraud cases discovered between 2000 and 2002 (e.g., Enron, WorldCom, Tyco, etc.).[5] Evidence in GAO's (2002) report on restatements for the period from 1997 to 2002 indicates that the number of firms restating their financial statements due to accounting irregularities increased by 145%. The report stated that for a number of the restating companies, "corporate management, boards of directors, and auditors failed in their roles, as have the securities analysts and credit rating agencies that did not identify problems before investors and creditors lost billions of dollars." Thus, there is a potential connection between the increase in corporate tax avoidance during the late 1990s and the weakening of corporate governance institutions (Coffee, 2002; Lennox, Lisowsky, & Pittman, 2013).

2.2. Regulatory changes in the early 2000s

During the early 2000s there was a change in the public perception about all corporate activities, including tax avoidance, due to corporate scandals such as Enron and WorldCom. This triggered a series of initiatives by the U.S. Congress that resulted in major changes to the tax and financial reporting requirements (e.g., reportable transactions disclosure requirements and SOX). In addition, the IRS and the U.S. Congress took several actions to address the concerns of increased (aggressive) corporate tax avoidance.[6] For example, in 2003 renewed enforcement efforts by the IRS resulted in an increase of 35% in the number of cases referred to the Justice Department for prosecution when compared to 2000.[7] For fiscal year 2004, audit rates on large businesses increased for the first time since the mid-1990s (Everson, 2004).[8]

These initiatives resulted in many firms taking actions to be more conservative with their tax planning due to the perceived increased compliance costs and detection risks. Frieswick (2006) documents that 25% of respondents to a financial executives' survey were using more conservative tax strategies in the period after 2003 and that over 60% indicated the biggest factor was the post-Enron governance climate. Furthermore, the increased skepticism and lack of trust on corporate management after the scandals of the early 2000s increased the reputational costs associated with aggressive tax positions because they were perceived as signs of inadequate corporate governance (Neubig & Sangha, 2004).

In addition, the corporate tax function faced challenges because of SOX's increased requirements on internal controls and financial reporting disclosures (Ernst & Young, 2004, 2006; Levin, Petrini, Smith, & White, 2006; Neubig & Sangha, 2004). For example, a survey of tax executives by KPMG (2006) states that "The passage of the Sarbanes-Oxley Act of 2002 […]—combined with still other legislative and regulatory changes of the past few years—are continuing to apply acute pressure to corporate tax departments' processes, technology, requirements, and people." Moreover, the same survey showed that as a result of the regulatory changes from the early 2000s many companies switched their priorities from tax planning and tax saving strategies to accuracy and tax return compliance. Results from KPMG's (2006) survey also indicated that about three quarters of the respondents were undertaking process improvements in many areas of their tax departments (e.g., increased internal review and higher levels of interaction with upper management, redesign of procedures related to domestic and international taxation). Therefore, the changes to firms' external governance environment may have reduced the resources available to invest in tax planning, increased managers' attention to managing tax compliance and tax risk, and may have reduced their opportunities to use tax avoidance activities as a way to achieving firms' short-term profitability goals.

3. Hypothesis development

The actions by Congress, the IRS and SEC during the early 2000s were geared towards improving firms' tax and financial reporting and boosting the overall corporate governance system. From the tax standpoint, regulators expected to see a reduction in corporate tax avoidance due to the stricter reporting requirements. But because of the seemingly simultaneous deterioration of both corporate governance and tax reporting system during the late 1990s it is important to understand the extent to which the tax avoidance levels of firms with weaker corporate governance structures during the late 1990s were more affected by the changes in the regulatory environment than other firms. I explore this question by examining whether or not there was a change in corporate tax avoidance as a result of the changes to the tax and corporate governance environments during the early 2000s, in particular for firms that were weakly governed during the late 1990s.

Several studies establish a link between weak corporate governance and tax avoidance. Desai and Dharmapala (2006, 2009a, 2009b) argue that managers of weakly governed firms can exploit the complexity of the tax system and their informational advantage to use tax avoidance for rent extraction purposes.[9] Desai and Dharmapala (2006) document a negative relation between the level of managerial shareholdings and book-tax differences, which is primarily associated with weak governance firms. They interpret the result as evidence of positive complementarities between aggressive tax avoidance and managerial rent extraction. Lanis and Richardson (2011) document a negative association between tax aggressiveness and the proportion of independent board members in their analysis of Australian firms. Their results suggest that independent boards of directors deter aggressive tax avoidance through better governance mechanisms.

Desai et al. (2007) explore the effect of the interaction between corporate governance and changes in tax enforcement. The authors argue that the effects of any corporate tax reform cannot be assessed without considering the preexisting corporate governance situation. The predictions from Desai et al.'s model suggest the effect of a change in tax regime on tax avoidance would be affected (1) directly by the increased costs imposed by the tax regime, and (2) indirectly by the resolution of tax-related agency issues (e.g., improvements to the corporate governance structure). Such effects should affect firms that pursue more aggressive tax activities and/or those with greater preexisting tax-related agency and/or internal control issues (i.e., weak governance firms). Therefore, I expect firms that were weakly governed during the late 1990s to experience the strongest impact from the regulatory environment change. In particular, weakly governed firms must have invested significant resources on improving their internal processes (including their tax function) by reallocating resources that otherwise would have been invested in tax planning activities (KPMG, 2006), which would result in a lower tax avoidance level. Similarly, managers of weakly governed firms may have been using tax avoidance strategies to improve short-term profitability that would be subject to

[5] Coffee (2002) defines gatekeepers as reputational intermediaries who provide verification and certification services to investors such as auditors, securities analysts and credit rating agencies.

[6] See Everson, 2003 Testimony before the Joint Review on IRS Reform (May 20, 2003).

[7] See "U.S. Reports Jump in Tax-Law Cases, 2004" *The Wall Street Journal* (April 7, 2004).

[8] See Hoopes et al.'s (2012) Figure 1 (p. 1611) for evidence indicating an increase in IRS's audit coverage for corporations with more than $10M in assets immediately after the year 2002.

[9] The following examples portrait how poor governance structures may lead to increased tax avoidance: aggressive tax avoidance positions may help managers to achieve short-term compensation goals or increase the funds at their disposition (i.e., the free cash-flow problem; Jensen, 1986); poor coordination between business units may result in tax positions with limited tax risk when considered in isolation but with excessive tax risk if considered at the firm level (Gallemore & Labro, 2015; Neubig & Sangha, 2004).

scrutiny under the new regulatory regime and may have chosen to eliminate such practices, which would also reduce the tax avoidance levels. To test my arguments, I propose the following hypothesis:

H1: Firms with weak governance characteristics during the late 1990s exhibit lower tax avoidance levels in the high-regulation period than in the low-regulation period, relative to other firms.

The research on the effects of corporate governance on tax avoidance and Desai and Dharmapala's (2006) managerial diversion (rent extraction) theory has been subject to considerable debate. For example, Seidman and Stomberg's (2017) findings suggest that Desai and Dharmapala's (2006) finding could be attributed to tax exhaustion and not to rent extraction from high-powered incentives on weak governance firms. Similarly, Armstrong et al. (2015) findings suggest that board of directors' independence and financial sophistication have a stronger relation with extreme levels of tax avoidance. Specifically, stronger governance is negatively related to tax avoidance when tax avoidance is already high and it is positively related to tax avoidance when tax avoidance is low. Blaylock (2016) fails to find evidence of an association between tax avoidance and economically significant rent extraction among U.S. firms. Desai and Dharmapala's (2006) theory has also been subject to significant criticism because of the lack of specific evidence about how managers extract rents from tax avoidance activities (Armstrong et al., 2015).

The focus of my study may provide insights about how the interrelation between external and internal governance mechanisms relate to tax avoidance and further our understanding of the link between corporate governance and tax avoidance. A plausible explanation for my argument that does not rely on the rent diversion hypothesis is that weakly governed firms reduce their tax avoidance because of lack of resources to invest in tax planning given such firms are likely to invest more resources to improve their internal processes for tax compliance and reporting purposes relative to other firms. Such explanation is consistent with anecdotal evidence and survey evidence (e.g., Ernst & Young, 2004, 2006; Frieswick, 2006; KPMG, 2006; Levin et al., 2006; Neubig & Sangha, 2004) indicating a shift in firms' tax strategies due to the stricter regulatory regime.

4. Method

This section discusses the definition of the external monitoring regimes and the operationalization of the theoretical constructs tax avoidance and corporate governance. I also specify the regression equation used in the multivariate analyses.

4.1. External monitoring regimes

The main sample in this study spans the period from 1997 to 2005. I divide the sample into a low-regulation (years 1997–2000) and a high-regulation (years 2003–2005) period. The low-regulation period includes the late 1990s when (1) aggressive corporate tax avoidance was booming (U.S. Treasury, 1999) and (2) most of the high-profile accounting scandals (e.g., Enron, WorldCom) were underway but undetected. The high-regulation period contains the years when (1) the IRS re-focused its efforts to curb aggressive tax reporting and (2) the initiation of SOX disclosures requirements.[10] The high-regulation period, as defined, is also free from firms' anticipatory actions to the implementation of the reporting requirements of Financial Interpretation No. 48 (FIN No. 48), Accounting for Uncertainty in Income Taxes (FASB, 2006), which occurred only after 2005 (Blouin, Gleason, Mills, & Sikes, 2010).

I define the years 2001 and 2002 as the transition period and eliminate the observations in that period from the analysis. The discontinuity between regulatory regimes provides a more powerful test of the effects of the regulatory changes.[11] The transition period includes the discovery period that led to the increased enforcement activity, the year before and the year of SOX's enactment and the increase in the general public's awareness and scrutiny of corporate reporting and governance deficiencies. This definition does not necessarily represent a bright-line cut-off for the implementation of the new rules and regulation but rather marks the time when the IRS, the SEC, and the public demanded more transparency in firms' financial and tax reporting. This transition period includes the economic slowdown due to the events of September 11, 2001, the discovery of several material financial statement fraud cases, and the demise of Arthur Andersen LLP. The intent of this design choice is to include the exogenous shocks to the external reporting environment in the transition period in a way that the low-regulation period includes firms' reporting and governance choices unaware of the coming paradigm shift, while the high-regulation period includes their reporting choices in response to the paradigm shift.

4.2. Operationalization of tax avoidance

I use two measures to operationalize tax avoidance: permanent book-tax differences and cash ETRs. Both measures conceptualize tax avoidance as a reduction in explicit taxes and do not distinguish between real activities undertaken to reduce tax liabilities and targeted tax benefits from lobbying activities (Dyreng et al., 2008; Hanlon & Heitzman, 2010). Furthermore, these measures do not distinguish whether or not the tax reduction activities are within the law. The definitions reflect the fact that some tax avoidance activities add value for shareholders, some activities, while legal, may represent rent-extraction opportunities for managers and some activities are proscribed by law. Finally, the definitions enable the analysis to capture the cross-sectional variation in tax avoidance due to both tax planning and corporate governance changes in response to the change in the external monitoring environment.

I use permanent book-tax differences for several reasons. First, the tax literature documents positive association between book-tax differences and tax avoidance. For example, Mills (1998) documents a positive association between the book-tax differences and IRS's proposed audit adjustments (a proxy for taxpayer non-compliance). Evidence in Desai and Dharmapala (2009a) and Wilson (2009) also suggests that book-tax differences are associated with tax avoidance. Second, permanent book-tax differences mitigate the effect of accruals earnings management that affects other tax avoidance proxies such as total and temporary book-tax differences (Hanlon, 2005; Phillips, Pincus, & Rego, 2003). This permits me to study the effect of regulatory regimes changes on tax avoidance while mitigating the potential noise introduced by accruals earnings management. Third, using permanent book-tax differences to measure tax avoidance aligns with the perception that ideal tax shelters (an extreme form of tax avoidance) are those that generate permanent book-tax-differences (e.g., Shevlin, 2002; Weisbach, 2002).

I follow Frank, Lynch, and Rego (2009) method to calculate permanent book-tax differences. First, I estimate total book-tax differences by adjusting pre-tax financial income for the impact of minority shareholders (Hanlon, LaPlante, & Shevlin, 2005). Then, I define taxable income for firm i at time t as:

$$taxinc_{i,t} = [(fedte_{i,t} + forte_{i,t})/str_i] - \Delta nol_{i,t} \quad (1)$$

where *fedte*, *forte*, *str*, and Δnol refer to current federal income tax expense, current foreign income tax expense, top statutory tax rate, and change in net operating loss. The total book-tax difference is then:

[10] During this period the public continued its scrutiny and skepticism of corporations' financial and tax affairs.

[11] I conduct several sensitivity tests regarding the definitions of the transition, the low-regulation and the high-regulation periods and find no significant changes to the inferences drawn from the main analyses (see Table 8).

$$totbtd_{i,t} = pre - tax\ income_{i,t} - taxinc_{i,t} \quad (2)$$

I calculate the temporary book-tax difference for firm i in year t as:

$$tempbtd_{i,t} = (feddte_{i,t} + fordte_{i,t})/str_t \quad (3)$$

where *feddte* and *fordte* refer to deferred federal and foreign income tax expense.[12] The permanent book-tax difference is then:

$$permbtd_{i,t} = totbtd_{i,t} - tempbtd_{i,t} \quad (4)$$

which I scale by lagged total assets for the analyses.

I use cash ETRs because this measure is not affected by the effect of changes in estimates such as the deferred tax asset valuation allowance and/or reserves for uncertain positions and takes into account the tax benefits of employee stock options, and tax deferral strategies (Dyreng et al., 2008; Hanlon & Heitzman, 2010). Using cash ETRs also mitigates noise associated with accruals-based earnings management that influence other tax avoidance measures. I define *cashetr* as the ratio of tax paid to pre-tax income.[13]

An important concern regarding the tax avoidance measures used in the analyses is that both are annual measures that may not reflect the long-run nature of certain tax avoidance strategies and/or may be distorted by one-time transactions.[14] However, I believe the annual measures are appropriate for the scope of the study because they capture the variation in firm's annual tax avoidance levels that reflect managers' actions to modify a firm's tax avoidance strategy in response to regulatory changes. Evidence in Hoopes et al. (2012) supports this view since 69.2% of the tax executives responding their survey (Hoopes et al., 2012, pp. 1637–1638) agree that a firm could alter their tax plans or positions within a year.

The following concerns about the tax avoidance proxies should also be considered. First, both permanent book-tax differences and cash ETRs fail to capture conforming tax avoidance and implicit taxes (Hanlon & Heitzman, 2010). Second, using financial statement data to estimate taxable income and book-tax differences creates a measurement error problem attributed to the treatment of non-qualified stock options, net operating losses, consolidation differences, and reserves for uncertain tax positions, among others (Hanlon, 2003; McGill & Outslay, 2004). Third, there may be a mismatch between the numerator and the denominator of the cash ETR because taxes paid (the numerator) includes all income tax payments to regardless of the period when the liability originated while pre-tax income (the denominator) only reflects the current period earnings (Hanlon & Heitzman, 2010).

I mitigate the aforementioned concerns by: (1) using both measures to increase the robustness of the results; (2) controlling for factors known to be associated with tax avoidance measures to prevent the correlated omitted variable problem; and (3) including firm-specific fixed effects to control for unobservable factors that may be correlated with firm-specific tax avoidance activities.

4.3. Operationalization of corporate governance strength

Corporate governance is a theoretical construct with no consensus about the best measure that captures the concept that a firm's corporate governance is a combination of internal and external mechanisms that prevent managers from expropriating shareholders' wealth (Schleifer & Vishny, 1997). To address this issue, I combine several indicators of corporate governance strength (similar to DeFond, Hann, & Hu, 2005) and produce an overall corporate governance score (*govscore*). This corporate governance measure is consistent with the concept that a firm's governance structure is a set of contracts, relationships and institutional features that cannot be captured by a single corporate governance characteristic (Armstrong et al., 2015).

The *govscore* is composed of five board of directors attributes (CEO-Chair separation, BOD's independence, blockholdings, experience and attendance), three audit committee (AC) attributes (size, independence and governance expertise),[15] Gompers, Ishii, and Metrick's (2003) shareholder rights index (G-Index), and the percentage shares held by institutional investors. For each characteristic (see Appendix A for details), I define an indicator variable that takes the value of zero to indicate weak governance and one to indicate strong governance. I calculate the *govscore* by adding the indicator variable scores for each firm-year, which results in assigning each firm-year an integer between zero and 10 that represents their overall corporate governance strength. I identify a firm as weakly governed if its *govscore* is four or less. The indicator variable *weak_gov* is set to one if a firm's *govscore* is four or less for years 1999 and 2000; *weak_gov* is set to zero otherwise.[16]

A limitation of *govscore* is that it may be affected by an endogeneity problem because the observed corporate governance characteristics in a firm may have been influenced by the firm's prior performance (Hermalin & Weisbach, 1998).[17] In particular for this study, the hypothesized cross-sectional differences in firms' tax avoidance (an endogenous variable) are driven by the change in the regulatory regime (an exogenous shock) and the quality of the firms' corporate governance (potentially endogenous) prior to the change in regulatory regime. Although a firm's corporate governance structure is certainly the result of simultaneous choices made by shareholders, directors and managers that may be influenced by firms' performance (Wintoki, Linck, & Netter, 2012), in my research setting those decisions are taken during the low-regulation period and, therefore, are exogenous to the period of interest (i.e., the high-regulation period). Furthermore, it is unlikely that firms' chose their corporate governance characteristics during the low-regulation in anticipation to the upcoming regulatory regime changes.

In addition, the potential endogeneity problem related to firms' corporate governance is mitigated through the use firm-specific fixed effects that control for unobservable firm heterogeneity that may create an omitted correlated variable problem if an unobservable firm characteristic is a common determinant of both corporate governance and tax avoidance (Jiraporn & Lee, 2017). Moreover, from the practical standpoint, tax planning may be one of the many factors considered when choosing corporate governance mechanisms but it is certainly not the main factor that drives corporate governance choices, which makes the occurrence of a simultaneity issue between tax avoidance and corporate governance less likely.[18]

[12] Following Hanlon (2005), if *feddte* is missing, *tempbtd* is computed as the total deferred tax expense for firm i year t divided by the top statutory tax rate.

[13] To address interpretability issues on current year cash ETRs for firms with negative income or those receiving tax refunds, I follow Gupta and Newberry (1997) and set *cashetr* equal: (1) to zero for firms receiving tax refunds (i.e., negative tax paid), (2) to one for firms with positive tax paid and non-positive income, and (3) to one for firms where *cashetr* was greater than one in order to mitigate the distortions created by small denominators. As a robustness check, I conducted the analysis by excluding negative cash ETR firms from the sample. Results from those analyses are qualitatively similar to those reported in Table 5.

[14] From the empirical implementation perspective, although a long-run measure of cash ETR is preferred to an annual measure, calculating a long-run cash effective tax rate measure with at least three consecutive observations for the sample period of 1997–2005 (excluding the transition period) results in a sample reduction of approximately 1600 firm-years that significantly reduces the power of the tests.

[15] Typical functions of the audit committee include the oversight of firms' financial reporting and disclosures as well as the monitoring of their regulatory compliance and risk management. Therefore, the audit committee has oversight power over tax planning and avoidance activities because of the spillover effects of those activities over the financial reporting and regulatory compliance aspects of the business.

[16] The *govscore* cut-off at four or less represents the lowest quartile of the distribution of *govscore* for all the firms with data available to construct the *govscore* for years 1999 and 2000 and aims to identify firms with the lowest corporate governance quality during the low-regulation period. Sensitivity tests (see Table 7) suggest the main results are robust to alternative definitions of *weak_gov*.

[17] As noted in Chenhall and Moers (2007), no single study using archival data is completely free of endogeneity issues. Therefore, I discuss how my research design and the theorized relations between corporate governance and tax avoidance mitigate the concern that the estimates and inferences in the study are biased because of an endogeneity problem.

[18] See Armstrong et al. (2015) for a similar argument.

4.4. Empirical specification

I investigate how the changes in the external monitoring regime during the early 2000s affected firms' tax avoidance levels using fixed effects (FE) regressions. I use the FE method to control for firm-specific unobserved heterogeneity, thereby mitigating (1) the omitted variables problem that arises if unobservable firm-specific effects are correlated with the independent variables (Cameron & Trivedi, 2005, Chapter 21) and (2) the endogeneity concerns inherent in corporate governance research.

I specify the following equation to test my hypothesis:

$$\begin{aligned} taxavoid_{i,t} = {} & \beta_1 post\Delta reg_t + \beta_2 post\Delta reg_t \\ & \times \text{weakgov}_{k,i} + \gamma_1 ppe_{i,t} + \gamma_2 chgpostret \\ & + \gamma_3 salesgrowth_{i,t} + \gamma_4 \text{intang}_{i,t} + \gamma_5 uncon_{i,t} + \gamma_6 statetax_{i,t} \\ & + \gamma_7 opercashflow_{i,t} + \gamma_8 mtr_{i,t-1} + \gamma_9 \text{r\&d}_{i,t} + \gamma_{10} leverage_{i,t} \\ & + \gamma_{11} foreign_{i,t} + \gamma_{12} daccr_{i,t} + \gamma_{13} analyst\text{cov}_{i,t} + \gamma_{14} epsgrowth_{i,t} \\ & + \gamma_{15} \ln(ta_{i,t}) + c_i + \varepsilon_{i,t} \end{aligned} \tag{5}$$

where the *taxavoid* is either *permbtd* or *cashetr*.[19] Eq. (5) builds on models used in Manzon and Plesko (2002), Rego (2003), Frank et al. (2009), and Robinson et al. (2010).

The indicator variable *postΔreg* equals one if the observation belongs to the high-regulation period; zero otherwise. The coefficient on *postΔreg* is of interest because it represents the average effect of the external monitoring regime changes on tax avoidance and establish a benchmark to compare the cross-sectional differences between *weak_gov* firms and other firms in the sample. A negative (positive) coefficient on *postΔreg* when *permbtd* (*cashetr*) is the dependent variable would suggest that, on average, the regulatory regime changes of the early 2000s induced a reduction in corporate tax avoidance. A positive (negative) on coefficient on *postΔreg* in when *permbtd* (*cashetr*) is the dependent variable would indicate that, on average, the external regime changes did not induce a reduction in firms' tax avoidance activities.

The variable of interest for my research hypothesis is the interaction between *postΔreg* and *weak_gov*. A negative (positive) coefficient on the interaction term when *permbtd* (*cashetr*) is the dependent variable would support the hypothesis that firms identified as weakly governed during the low-regulation period exhibit lower tax avoidance activities in response to the tax environment changes of the early 2000s than other firms in the sample. Eq. (5) does not include the linear term for *weak_gov* because the variable is based on the *govscore* during the low-regulation period and cannot be identified separately from the firm-specific fixed-effect *c*.[20]

Eq. (5) include control variables to isolate the effect of the interaction between the tax environment changes and weak governance.[21] I expect *ppe* to be positively (negatively) associated with *permbtd* (*cashetr*) because cost recovery deductions reduce taxable income. The variable *chgpostret* controls for differences in the accounting treatment of retirement benefits between tax and accrual accounting. I anticipate a negative (positive) coefficient on *chgpostret*, consistent with Manzon and Plesko (2002) when *permbtd* (*cashetr*) is the dependent variable. Sales growth (*salesgrowth*) controls for differences in revenue-recognition rules between GAAP and tax statutes. The variable *intang* controls for differences between the financial and tax accounting rules for goodwill and other intangibles. I expect a positive (negative) relation between *intang* and *permbtd* (*cashetr*). I include a control for income or loss attributable to the equity method (*uncon*) due to differences between the financial accounting and tax rules regarding minority interests. Current state income tax expense (*statetax*) controls for the effect of state taxes on generating permanent book-tax differences that are not associated with tax avoidance.

Operating cash flows (*opercashflow*) controls for firms' profitability and lagged estimated marginal tax rates (*mtr*) control for firms' incentives to invest in tax planning; I predict a positive association between tax avoidance and each of these variables. The variable *r&d* accounts for the double impact of qualified research and development (R&D) activities on the firm's taxable income due to their deductibility and the availability of the R&D credit (Manzon & Plesko, 2002; Wilson, 2009), which may result in a positive (negative) association with *permbtd* (*cashetr*). Alternatively, *r&d* may exhibit a negative (positive) association with *permbtd* (*cashetr*) if managers exhaust all possible benefits from R&D deductions and credits before engaging in other tax avoidance activities. Leverage controls for the effect of the presence of debt on tax aggressiveness. A negative (positive) association between *leverage* and *permbtd* (*cashetr*) would be consistent with firms using debt as a substitute for other tax planning alternatives (Graham & Tucker, 2006); a positive (negative) association of leverage with *permbtd* (*cashetr*) association would be consistent with debt generating benefits from interest deductions. Foreign operations provide firms with tax arbitrage opportunities (Lisowsky, 2010; Moore, 2012; Rego, 2003). Thus, *foreign* controls for the effect of firms exploiting those opportunities, and I expect it to exhibit a positive (negative) association with *permbtd* (*cashetr*).

Variables *daccr*, *analystcov* and *epsgrowth* control for the effect of financial reporting incentives on tax avoidance (Frank et al., 2009). Discretionary accruals (*daccr*) are included because prior research documents a positive association between book-tax differences and discretionary accruals (Frank et al., 2009). Analyst coverage (*analystcov*) is included to control for managers' incentives to manage earnings to meet or beat analyst forecasts (Kasznik, 1999). The variable *epsgrowth* controls for managers' incentives to show annual earnings growth (Graham, Harvey, & Rajgopal, 2005). This indicator variable equals one if the year-to-year change in earnings per share is between plus or minus five cents; it is zero otherwise. I expect the coefficients on *daccr*, *analystcov* and *epsgrowth,* to have a positive (negative) association with *permbtd* (*cashetr*).

Finally, the natural logarithm of total assets, ln(*ta*), controls for the effect of firm size on tax avoidance. A positive (negative) association of ln(*ta*) with *permbtd* (*cashetr*) would be consistent with larger firms having greater economies of scale in tax planning (Rego, 2003). On the other hand, a negative (positive) association of ln(*ta*) with *permbtd* (*cashetr*) would be consistent with the political cost hypothesis that suggests larger firms are subject to greater public scrutiny (Watts & Zimmerman, 1986, p. 235) and will exhibit lower tax avoidance levels.

5. Data and descriptive statistics

5.1. Sample selection

Data are obtained from the intersection of COMPUSTAT, Risk Metrics Historical Governance and Historical Directors, CDA/Spectrum Institutional (13f) Holdings, and Institutional Brokers Estimate System databases. The data set is an unbalanced panel of 2569 firm-years from 434 unique firms for the period 1997–2005 and is constrained to U.S. corporations outside the financial services and utilities industries (Table 1). Total firm-years with valid financial statement data are 25,284 (COMPUSTAT). Using the Risk Metrics databases to construct the governance variables eliminates 18,843 firm-years. Additional

[19] I use the same specification for both dependent variables because, in theory, both capture the same theoretical construct; for interpretation purposes, the signs on the independent variables are expected to move in opposite directions. I also use total book tax differences scaled by lagged total assets as an alternative proxy for tax avoidance. Results (untabulated) from such estimations are consistent with those obtained with *permbtd*.

[20] In alternative specifications of equation 5, I use OLS estimation with industry-level controls, which allows the inclusion of the *weak_gov* linear term. However, evidence in Amir, Carabias, Jona, and Livne (2016) suggests firm-specific fixed effects provide more reliable estimates and inferences than higher-level fixed effects such as industry effects.

[21] Appendix B provides detailed variable definitions.

Table 1
Data set construction detail.

Firm-year observations with all the financial statement data required to construct the variables used in the analyses excluding financial services and utilities industries	25,284
Less:	
Firm-years not included on the Risk Metrics Historical Governance and/or Directors Databases	(15,428)
Firm-years without enough data to construct governance score for the low-regulation period	(3415)
Firm-years for which estimated marginal tax rates were not available	(1721)
Firm-years in the transition period (2001 − 2002)	(1055)
Firm-years without at least one observation in the pre-regulation period (1997–2000) and one in the high-regulation period (2003–2005)	(1096)
Final sample available to conduct the tests	2569

observations drop from the sample due to lack of simulated marginal tax rates (1721). Requiring each firm to have at least one observation in each of the low-regulation and the high-regulation periods and eliminating firm-years in the transition period further reduces the data set by 2151 observations.

5.2. Descriptive statistics

Firm-years are evenly distributed throughout the sample period (Table 2, Panel A) ranging from 13% to 15% observations per year. The durables manufacturing industry is over-represented relative to other industries in the sample but untabulated results indicate this is consistent with COMPUSTAT's industry distribution. All industries represented in the sample have firms classified as weakly governed in the low-regulation period (Panel B) with the food (pharmaceutical) industry showing the lowest (highest) proportion with 16% (28%).

The distribution of *permbtd* has a mean of 0.017 and a median of 0.010 (Table 3, Panel A). The *cashetr* has a mean of 0.342 and a median of 0.290. The mean marginal tax rate, *mtr*, is 25.4%, which is lower than the top federal statutory rate for the sample period. In contrast, the median *mtr* is 35% indicating that > 50% of the firms in the sample faced at least the top federal statutory rate for every additional dollar of income they generated. Descriptive statistics for the remaining variables are similar to those reported on Manzon and Plesko (2002), Robinson et al. (2010), and Hoopes et al. (2012).

Panel B of Table 3 shows the mean behavior of *permbtd* and *cashetr* over the sample period. Both *permbtd* and *cashetr* show patterns that are consistent with a steady increase in tax avoidance from 1997 to 2004 (*permbtd* 0.016 in 1997 and 0.022 in 2004; *cashetr* 0.361 for 1997 and 0.313 in 2004) and then a slight decrease in 2005 (*permbtd* 0.017; *cashetr* 0.355).[22] The mean behavior of the variables by governance classification suggests that during the low-regulation period *weak_gov* firms exhibited higher levels of tax avoidance than other firms in the sample. In contrast, during the high-regulation period the apparent trend on the variables suggest that *weak_gov* firms exhibited lower tax avoidance levels than the other firms in the sample. However, the tests of the mean annual differences between the two groups (i.e., *weak_gov* = 0 vs. *weak_gov* = 1) only indicate a significant difference at the 5% level in the year 1999 for *permbtd* (0.012) and significant differences (also at the 5% level) in years 1997 (−0.076) and 2005 (0.092) for *cashetr*.

The apparent decreasing trend in cash ETR through the 2004 may be partially explained by the effects of the incentives provided during the early 2000 that increased the statutory depreciation allowed on certain types of property (e.g., The Jobs and Growth Tax Relief Reconciliation Act of 2003). In addition, the apparent increasing trends in tax avoidance (based on both measures) are consistent with Grubert (2012) who documents an increase in the percentage of foreign profits reported by multinational corporations on the period from 1996 to 2004. The remaining increasing trends in tax avoidance may indicate that firms continued pursuing their tax avoidance strategies after external regime changes because the perceived tax avoidance costs and risks under the new tax and corporate governance regime were not greater than the benefits from pursuing their tax avoidance strategies. However, the apparent shift in the tax avoidance behavior of the *weak_gov* firms relative to the other firms in the sample may suggest, intuitively (although only a few statistical significance instances are documented in the table), that the external regime changes affected weak governance firms to a greater extent than other firms.

Table 4 reports a comparison of firms' characteristics by corporate governance classification. Data indicate no significant differences in most of the variables including return on assets. The significant differences appear in *uncon*, *foreign*, *epsgrowth* and ln(*ta*). Specifically, the data indicate *weak_gov* firms have, on average, a larger amount of minority interest income (0.002 vs. 0.001), lower number of foreign subsidiaries (2.034 vs. 2.315), larger incidence of earnings per share growth between +/− $0.05 (0.077 vs. 0.052) and are smaller (5.536 vs. 5.831). Therefore, the inclusion of those variables in the multivariate analysis is necessary to control for such effects and prevent an omitted correlated variable problem.

6. Multivariate results

6.1. Effect of the low-regulation period governance strength on the high-regulation period tax avoidance

Column 1 of Table 5 shows the results from estimating a reduced form of Eq. (5) to obtain a benchmark of the average effect of the regulatory regime changes on tax avoidance. Results from estimating Eq. (5) with *permbtd* as dependent variable (Table 5 Panel A, Column 1) show a positive and significant coefficient on *postΔreg* (0.009, *p-value* < 0.01) while the coefficient on *postΔreg* when *cashetr* is the dependent variable (Panel B) fails to achieve significance (−0.020, *p-value* = 0.17).[23] The evidence suggest that, on average, firms continued to pursue their tax planning strategies regardless of the increased scrutiny and reporting demands from the IRS, the SEC, and the general public.[24]

Table 5 Column 2 presents the estimation of Eq. (5) with *permbtd* (Panel A) and *cashetr* (Panel B) as dependent variables. In Panel A, the coefficient on the interaction between *weak_gov* and *postΔreg* is negative and significant (−0.015, *p-value* = 0.01) indicating that firms that had weak governance structures in the low-regulation period exhibited lower tax avoidance in the high-regulation period relative to other firms, consistent with my hypothesis. Similarly, in Panel B the interaction *postΔreg* × *weak_gov* shows a positive and significant coefficient (0.069, *p-value* < 0.01). Together, the findings suggest that firms that were weakly governed during the late 1990s experienced lower levels of tax avoidance subsequent to the external regime changes of the early 2000s relative to other firms. These results are consistent with weakly governed firms being more likely to have weaknesses in their tax functions' internal controls that prevented them from continuing their tax strategies without incurring increased tax compliance and reputational costs, which resulted in reduced tax avoidance levels relative to other firms. The results are also explained by a reduction in managers' opportunities to use of tax avoidance to achieve short-term profitability goals due to the increased scrutiny by the IRS, SEC and the general public in response to the corporate scandals of the early 2000s.

[22] The trends are consistent with Manzon and Plesko (2002) and Dyreng, Hanlon, Maydew, and Thornock (2017).

[23] Significance levels on regression analyses are based on robust standard errors clustered at the firm-level to control for heteroskedasticity and serial correlation; tests are one-tailed where signs are predicted; two-tailed, otherwise.

[24] These results are consistent across all the estimations of equation 5 presented throughout the manuscript.

Table 2
Sample distribution by industry and governance classification.

Panel A: Distribution of observations across industries and years

	Year								
Industry	1997	1998	1999	2000	2003	2004	2005	Total firm-years by industry	
Chemicals	25	25	24	25	21	24	20	164	6%
Computer	37	39	37	40	40	39	37	269	10%
Durable Manufacturing	145	159	165	172	164	159	151	1115	43%
Food	17	18	16	14	16	14	14	109	4%
Pharmaceutical	21	20	19	21	21	24	22	148	6%
Retail	65	73	70	74	72	76	67	497	19%
Textile and Printing	36	38	37	38	40	42	36	267	10%
Total firm-years	346	372	368	384	374	378	347	2569	
	13%	14%	14%	15%	15%	15%	14%	100%	

Panel B: Percentage of firms/firm-years classified as weakly governed during the low-regulation period

	Firms			Firm-years		
Industry	Total	Weak_gov		Total	Weak_gov	
		No.	%		No.	%
Chemical	26	6	23%	164	40	24%
Computer	42	7	17%	269	40	15%
Durable manufacturing	186	32	17%	1115	201	18%
Food	19	3	16%	109	19	17%
Pharmaceutical	25	7	28%	148	43	29%
Retail	91	19	21%	497	103	21%
Textile and printing	45	10	22%	267	59	22%
Total	434	84	19%	2569	505	20%

Industry classification is based on Barth, Beaver, and Landsman (1998). See Appendices A and B for details about the governance classifications. Sample period is 1997–2000 (low-regulation) and 2003–2005 (high-regulation). Sample size is 2569 firm-years from 434 distinct firms. Panel A shows the percentage of firm-years per industry (right column) and the percentage of firm-years per year (bottom row). Panel B shows the percentage of firms/firm-years identified as weakly governed during the low-regulation period.

The parameter estimates on *chgpostret* and *salesgrowth* are significant and in the predicted direction in both Panels A and B. The coefficient in *opercashflow* shows significant coefficients (0.065, *p-value* = 0.03 in column 2, panel A; −0.731, *p-value* < 0.01 in column 2, panel B) indicating a positive relation between profitability and tax avoidance. The coefficient on *r&d* shows a negative and significant association with tax avoidance (−0.574, *p-value* < 0.01 in column 2, panel A; 2.154, *p-value* < 0.01 in column 2, panel B), implying R&D-intensive firms use R&D credits and deductions before engaging in other tax avoidance strategies. Finally, the coefficient *epsgrowth* suggests positive complementarities between financial and tax reporting aggressiveness. Specifically in Column 2, when *permbtd* is the dependent variable (Panel A) *epsgrowth* is positive and significant (0.009, *p-value* = 0.05); the parameter estimate is negative and significant (−0.043, *p-value* < 0.01) when *cashetr* is the dependent variable (Panel B).

The estimation of the alternative specifications of Eq. (5) using industry-specific FE (Column 3 of panels A and B) show results consistent with those from the estimation using firm-specific FE estimations. Specifically, the coefficient on the interaction between *weak_gov* and *postΔreg* is negative (−0.011, *p-value* = 0.05) in panel A and it is positive and significant (0.072, *p-value* < 0.01) in panel B both supporting my hypothesis. The coefficient on *weak_gov* when *cashetr* is the proxy for tax avoidance (panel B) is negative and significant (−0.043, *p-value* = 0.02) suggesting a positive relation between weak governance and tax avoidance. However, since my research question focuses on the effect of the interaction between *weak_gov* and regulatory regimes changes on tax avoidance, and the interaction is significant in both panels A and B, interpreting the coefficient on *weak_gov* (the linear term) is less relevant. That is, the coefficient on *weak_gov* does not reveal much about the relationship between corporate governance and tax avoidance because the changes in regulatory regime moderate the relationship.

6.2. Exploring the effect of changes in corporate governance on tax avoidance

To further explore the effect of the interaction between corporate governance and the increase in external monitoring, I examine the effects of changes in firms' corporate governance classification across the regulation periods on tax avoidance. For this part of the analysis, I calculated *govscore* for firms with available data on the high-regulation period, which reduces the sample to 2042 firm-years from 325 individual firms.

Untabulated results indicate that about 81% of the firms changed their governance score by plus or minus one, 7% exhibited a reduction in *govscore* of two or more (i.e., their governance deteriorated in the high-regulation period relative to the low-regulation period), and 12% experienced an increase in *govscore* of two or more relative to the low-regulation period. Further analysis of the data indicates that 18% of the firms are classified as *weak_gov* in the low-regulation period and 17% are classified as *weak_gov* in the high-regulation period. Based on the definition of *weak_gov*, the data reveal the following: 8% of the firms in the sample remained classified as weakly governed, 11% improved their governance classification, and 9% of the firms changed to weakly governed; the remaining 72% of firms did not change to weakly governed. I use these latter data to define *w_impr* as an indicator variable set to one if *govscore* is four or less (five or more) in the low- (high-) regulation period; *w_impr* is zero otherwise.

I substitute *weak_gov* with *w_impr* in Eq. (5) to analyze the effect of improvements to corporate governance strength and external monitoring regime on tax avoidance. This analysis should provide evidence regarding the combined effect of the change in regulatory regime and an improvement in firms' internal governance structure. A negative association between tax avoidance and the interaction between *postΔreg* and *w_impr* would suggest the effect documented in Table 5 may be explained by those firms that improved their governance during the high-regulation period.

Table 6 Column 1 presents the results from the estimation with *permbtd* as the tax avoidance measure.[25] Results in Column 1 show non-significant coefficient on the interaction of *postΔreg* and *w_impr* (−0.009, *p-value* = 0.103). Column 2 presents a positive and marginally significant coefficient (0.050, *p-value* = 0.084) on the interaction *postΔreg*×*w_impr* when *cashetr* is the dependent variable.

Results in Table 6 provide weak evidence indicating that firms that improved their governance structures from the low-regulation to the high-regulation period exhibited lower tax avoidance levels during the high-regulation period relative to other firms. The result is consistent with the argument that that during the high-regulation period those firms that invested more resources on improving their internal governance structures either: (1) could not simultaneously invest in tax avoidance strategies to keep up with other firms or (2) identified and eliminated riskier tax strategies, which resulted in lower tax avoidance levels relative to other firms.

However, the evidence suggests that improvements to firms' corporate governance structures were not a necessary condition to show a reduction in tax avoidance because the stricter regulatory environment induced an overall decrease in tax avoidance for those firms with weaker governance structures during the low-regulation period.

[25] I also conduct the analyses with *w_impr* as the corporate governance variable using the alternative OLS specifications with industry controls and find quantitatively similar results as those reported in Table 6.

Table 3
Descriptive statistics.

Panel A: Variables in regression analyses

Variable	Mean	Standard deviation	First quartile	Median	Third quartile
permbtd	0.017	0.062	0.000	0.010	0.028
cashetr	0.342	0.274	0.173	0.290	0.390
ppe	0.591	0.307	0.361	0.542	0.774
chgpostret	0.000	0.003	0.000	0.000	0.000
salesgrowth	0.114	0.189	0.020	0.084	0.175
intang	0.159	0.180	0.014	0.094	0.249
uncon	0.001	0.004	0.000	0.000	0.000
statetax	0.004	0.005	0.000	0.002	0.006
opercashflow	0.122	0.086	0.069	0.114	0.166
mtr	0.254	0.143	0.068	0.350	0.350
r&d	0.040	0.065	0.000	0.013	0.049
leverage	0.202	0.150	0.067	0.202	0.307
foreign	2.260	2.131	1.000	2.000	3.000
daccr	0.016	0.506	−0.069	−0.004	0.061
analystcov	0.011	0.013	0.003	0.006	0.013
epsgrowth	0.057	0.232	0.000	0.000	0.000
ln(*ta*)	5.73	1.565	4.708	5.683	6.768

Panel B: Mean behavior of *permbtd* and *cashetr* by governance classification

Mean *permbtd*	1997	1998	1999	2000	2003	2004	2005
full sample	0.016	0.011	0.012	0.017	0.020	0.022	0.017
weak_gov = 1	0.020	0.004	0.021	0.022	0.015	0.012	0.012
weak_gov = 0	0.016	0.013	0.009	0.016	0.022	0.024	0.018
Difference	0.004	−0.009	*0.012*	0.006	−0.006	−0.012	−0.006
Mean *cashetr*	1997	1998	1999	2000	2003	2004	2005
full sample	0.361	0.389	0.327	0.326	0.326	0.313	0.355
weak_gov = 1	0.300	0.359	0.337	0.296	0.338	0.338	0.430
weak_gov = 0	0.376	0.397	0.325	0.333	0.333	0.308	0.338
Difference	*−0.076*	−0.038	0.012	−0.037	0.005	0.030	*0.092*

Variables are defined in Appendix B. Sample period is 1997–2000 (low-regulation) and 2003–2005 (high-regulation). Sample size is 2569 firm-years. All continuous variables are winzorized (reset) at the first and 99th percentiles. Panel B reports mean differences in *permbtd* and *cashetr* between weakly governed and non-weakly governed firm-years throughout the sample period (*italics* indicate significance at the 5% level or better).
The underline is to indicate the next line is the difference between the prior two terms (i.e., weak_gov = 1 minus weak_gov = 0).

Table 4
Descriptive statistics by governance classification (*weak_gov*).

Variables	No	Yes	Diff.	*t*-test
roa	0.114	0.112	0.002	0.359
permbtd	0.017	0.015	0.002	0.539
cashetr	0.341	0.342	(0.001)	0.071
ppe	0.586	0.608	(0.022)	(1.463)
chgpostret	0.000	0.000	0.000	0.058
salesgrowth	0.112	0.120	(0.008)	(0.863)
intang	0.159	0.158	0.001	0.126
uncon	0.001	0.002	(0.001)	(3.571)
statetax	0.004	0.004	0.000	1.583
opercashflow	0.123	0.119	0.004	0.962
mtr	0.252	0.258	(0.006)	(0.798)
r&d	0.040	0.039	0.001	0.238
leverage	0.200	0.211	(0.010)	(1.361)
foreign	2.315	2.034	0.281	2.662
daccr	0.012	0.034	(0.022)	(0.891)
analystcov	0.011	0.011	0.000	0.007
epsgrowth	0.052	0.077	(0.025)	(2.161)
ln(ta)	5.831	5.536	0.295	3.804
N	2064	505		

Return on assets (*roa*) is defined as pre-tax income divided by total assets; all other variables are defined in Appendix B. ***, ** Indicate significance at the 1 and 5% levels, respectively. Sample period is 1997–2000 and 2003–2005.

6.3. Additional tests

6.3.1. Sensitivity to the weak governance (weak_gov) definition

As discussed previously, there is no consensus on how to measure a firm's corporate governance because a firm's corporate governance structure is a set of contracts, relationships and institutional features that cannot be captured by a single corporate governance characteristic (Armstrong et al., 2015). Therefore, I re-estimate Eq. (5) using two alternative definitions of *weak_gov* to test the robustness of the results reported in Table 5. For the first robustness test, I modify *govscore* by using audit committee independence as the only attribute of the audit committee included in the score, which reduces the number of attributes in *govscore* to eight. Then, I define *weak8_gov* as an indicator variable that takes the value of one if the firm's modified *govscore* is equal three or less for the last two years in the low-regulation period; *weak8_gov* is set to zero otherwise.[26] Column 1 of Table 7 presents the results from estimating Eq. (5) using *weak8_gov*. Results in Panel A indicate a negative and significant estimate (−0.009, *p-value* = 0.05) on the interaction between *weak8_gov* and *postΔreg,* consistent with my hypothesis and the results reported in Table 5. Also consistent with H1, results in Panel B show a positive and significant estimate (0.053, *p-value* = 0.01) on *weak8_gov* × *postΔreg*.

[26] If the firm's modified *govscore* is not available for both years 1999 and 2000, the modified *govscore* for 1999 or 2000 is used to define *weak8_gov*. The three or less cut-off effectively classifies 36% of the firms as weakly governed in the low-regulation period.

Table 5
Regressions examining the effect of tax and governance changes on tax avoidance.

Panel A: Dependent variable is permanent book-tax difference (*permbtd*)

Independent variables	Pred. sign	Column 1		Column 2		Column 3	
		Param. estimate	t-stat	Param. estimate	t-stat	Param. estimate	t-stat
postΔreg	+/−	0.009 ***	2.819	0.013 ***	3.605	0.011 ***	3.732
weak_gov	+/−	−	−	−	−	0.005	1.141
weak_gov × post Δ reg	−	−	−	−0.015 **	−2.296	−0.011 **	−1.672
ppe	+	0.029 **	2.178	0.030 **	2.235	−0.006	−0.960
chgpostret	−	−1.228 ***	−2.882	−1.264 ***	−2.969	−1.302 ***	−2.811
salesgrowth	+	0.018 **	2.058	0.018 **	1.985	0.036 ***	4.101
intang	+	0.019	1.047	0.018	1.007	−0.013	−1.178
uncon	+/−	−0.295	−0.592	−0.299	−0.604	0.079	0.327
statetax	+/−	0.506	0.966	0.553	1.060	−0.225	−0.596
opercashflow	+	0.067 **	1.931	0.065 **	1.891	0.138 ***	4.878
mtr	+	−0.004	−0.247	−0.005	−0.289	−0.020	−1.876
r &d	+/−	−0.575 ***	−4.206	−0.574 ***	−4.268	−0.058	−1.238
leverage	+/−	−0.040	−1.536	−0.038	−1.468	−0.015	−1.018
foreign	+	0.002 *	1.582	0.002 *	1.538	0.002 **	1.899
daccr	+	0.003	0.873	0.002	0.859	0.004 *	1.385
analystcov	+	0.285	0.939	0.304	1.004	0.271 *	1.572
epsgrowth	+	0.009 *	1.641	0.009 *	1.637	0.008 **	1.741
ln(*ta*)	+/−	0.001	0.106	0.001	0.219	0.000	−0.042
Firm fixed effects Industry fixed effects		Yes No		Yes No		No Yes	
Adjusted R2		0.083		0.086		0.069	
F		5.943		5.804		7.011	
Pr > F		< 0.001		< 0.001		< 0.001	

Panel B: Dependent variable is cash effective tax rate (*cashetr*)

Independent variables	Pred. sign	Param. estimate	t-stat	Param. estimate	t-stat	Param. estimate	t-stat
postΔreg	+/−	−0.020	−1.390	−0.034 **	−2.207	−0.046 ***	−3.457
weak_gov	+/−	−	−	−	−	−0.043 **	−2.403
weak_gov × post Δ reg	+	−	−	0.069 ***	2.444	0.072 ***	2.492
ppe	−	−0.066	−1.052	−0.070	−1.125	0.007	0.280
chgpostret	+	4.165 *	1.563	4.333 *	1.632	3.036 *	1.530
salesgrowth	−	−0.079 **	−1.771	−0.076 **	−1.717	−0.171 ***	−4.389
intang	−	−0.100 *	−1.442	−0.096 *	−1.390	0.026	0.583
uncon	+/−	−7.625 ***	−3.485	−7.606 ***	−3.591	−3.640 ***	−2.881
statetax	+/−	2.878 *	1.737	2.661	1.611	4.406 ***	3.323
opercashflow	−	−0.740 ***	−6.368	−0.731 ***	−6.344	−0.917 ***	−9.875
mtr	−	0.119	1.778	0.122	1.818	0.081	1.831
r &d	+/−	2.158 ***	5.697	2.154 ***	5.692	0.433 **	2.140
leverage	+/−	0.269 ***	3.342	0.261 ***	3.266	0.073	1.308
foreign	−	−0.002	−0.322	−0.002	−0.274	0.004	1.242
daccr	−	−0.016	−1.248	−0.016	−1.236	−0.018 *	−1.471
analystcov	−	0.423	0.413	0.336	0.332	−0.293	−0.471
epsgrowth	−	−0.043 ***	−2.554	−0.043 ***	−2.569	−0.061 ***	−3.649
ln(*ta*)	+/−	−0.028	−1.159	−0.031	−1.292	−0.013 **	−2.263
Firm fixed effects Industry fixed effects		Yes No		Yes No		No Yes	
Adjusted R2		0.108		0.111		0.113	
F		10.306		10.427		10.523	
Pr > F		< 0.001		< 0.001		< 0.001	

Variables are defined in Appendix B. ***, **, * Indicate significance at the 1, 5 and 10% levels, based on clustered-robust standard errors at the firm-level (two-sided if no sign is predicted). Sample period is 1997–2000 (low-regulation) and 2003–2005 (high-regulation). Sample size is 2569 firm-years. All continuous variables are winzorized at the first and 99th percentiles. In Column 3, industry fixed effects are based on two-digit SIC codes.

For the second robustness test, I use the original *govscore* and define *weakm_gov* as an indicator variable that is set to one if the firm's *govscore* is below the median of the *govscore* distribution; *weakm_gov* is set to zero otherwise.[27] The results from estimating Eq. (5) using *weakm_gov* are reported in Column 2 of Table 7. The coefficient on the interaction on *weak8_gov* × *postΔreg* fails to achieve significance (−0.003, *p-value* = 0.59) when *permbtd* is the tax avoidance measure (Panel A). However, the coefficient on the interaction is positive and significant (0.047, *p-value* = 0.033) when *cashetr* is the dependent variable, consistent with the results reported in Table 5.

Results in Table 7, in general, provide evidence consistent with the results in Table 5 and provide additional support to my finding that suggests a

[27] See Table A1 for descriptive statistics regarding the distribution of *govscore*.

Table 6
Fixed effects regressions examining the effect of tax environment changes and governance improvements on tax avoidance.

Dependent variable:	Column 1			Column 2		
	permbtd			*cashetr*		
Independent variables	Pred. sign	Param. estimate	t-stat	Pred. sign	Param. estimate	t-stat
postΔreg	+/−	0.013 ***	3.530	+/−	−0.036 **	−2.309
w_impr × *post* Δ *reg*	−	−0.009	−1.266	+	0.050 *	1.384
ppe	+	0.028 **	2.092	−	−0.080	−1.151
chgpostret	−	−0.990 ***	−2.362	+	2.198	0.836
salesgrowth	+	0.017 **	1.844	−	−0.023	−0.489
intang	+	0.016	0.839	−	−0.106 *	−1.370
uncon	+/−	−0.142	−0.255	+/−	−8.464 ***	−3.870
statetax	+/−	0.843	1.572	+/−	3.022 *	1.701
opercashflow	+	0.035	1.151	−	−0.636 ***	−5.043
mtr	+	0.003	0.168	−	0.115	1.569
r &d	+/−	−0.589 ***	−4.395	+/−	2.576 ***	5.746
leverage	+/−	−0.018	−0.708	+/−	0.236 ***	2.902
foreign	+	0.001	1.181	−	−0.007	−1.083
daccr	+	0.005 **	1.751	−	−0.013	−0.987
analystcov	+	−0.006	−0.020	−	0.154	0.130
epsgrowth	+	0.006	1.282	−	−0.019	−1.182
ln(*ta*)	+/−	0.000	−0.043	+/−	−0.008	−0.332
Adjusted R2		0.083			0.104	
F		5.144			8.030	
Pr > F		< 0.001			< 0.001	

Variables are defined in Appendix B. ***, **, * Indicate significance at the 1, 5 and 10% levels, based on clustered-robust standard errors at the firm-level (two-sided if no sign is predicted). Sample period is 1997–2000 (low-regulation) and 2003–2005 (high-regulation). Sample size is 2042 firm-years. All continuous variables are winzorized at the first and 99th percentiles. Corporate governance is based on the comprehensive governance score (*govscore*). A firm is classified as weak but improved (*w_impr*) if *govscore* is four or less in the low-regulation period and *govscore* is five or more in the high-regulation period; *w_impr* is zero otherwise. Firm-specific fixed-effects are included in all estimations.

reduction in tax avoidance in the high-regulation period for firms with weaker corporate governance during the low-regulation period.

6.3.2. Sensitivity to the transition and high-regulation periods definition

I conduct three sensitivity tests to mitigate concerns related to the definition of the transition and high-regulation periods. Conceptually, the transition period represents the timeframe when Congress, regulators (i.e., the IRS and SEC), and the public increased their scrutiny of corporations due to the alleged increase in corporate abuses and began demanding enhanced transparency in firms' tax and financial reporting practices. Relatedly, the high-regulation period represents the period when the IRS re-focused its efforts to curb aggressive tax reporting and SOX disclosures requirements took effect. In the main analyses, I define years 2001–2002 as the transition period and years 2003–2005 as the high-regulation period. In the first sensitivity test, I add the year 2006 to the high-regulation period and maintain the original definitions of the transition and low-regulation periods. Results using the extended high-regulation period (Panel A of Table 8, $n = 2766$) show a negative and significant coefficient (-0.014, *p-value* $= 0.017$) on the interaction *weak_gov* × *postΔreg* when *permbtd* is the dependent variable (Column 1). Similarly, the coefficient on the interaction is positive and significant (0.057, *p-value* $= 0.019$) for the estimation with *cashetr* as dependent variable (Panel A, Column 2). Both results are quantitatively similar to those reported in Table 5.[28]

In the second sensitivity test, I eliminate the year 2000 from the original sample and include it as part of the transition period. Results of the estimation of Eq. (5) using the remaining 2185 observations indicate (see Table 8, Panel B) yield the same inferences as those reported in Table 5. For the final sensitivity test on the definitions of the transition and high-regulation periods, I extend the sample to include observations from the year 2007 and define (and eliminate) the transition period as years 2001–2003 ($n = 2582$). Results from the estimation of Eq. (5) using the adjusted sample (Table 8, Panel C) are also consistent with the results in Table 5.

In general, the results presented in Table 8 indicate that the main findings reported in Table 5 are robust to variations on the definitions of the transition and high-regulation periods.

6.3.3. Sensitivity to size effects

To mitigate concerns that size effects may not be resolved by controlling for size in the multivariate analyses, I partitioned the main sample at the median into two groups based on total assets. Then, I estimated Eq. (5) on the bottom ($n = 1284$) and top ($n = 1285$) halves sub-samples. Results from the estimations are similar to those documented in Table 5. The tests provide evidence that, in general, results do not vary by firm size (or a denominator problem where *permbtd* is the proxy for tax avoidance).

6.3.4. Sensitivity to industry effects

In addition to using the alternative specification of Eq. (5) that includes industry fixed effects directly control for industry effects, I estimate Eq. (5) on subsamples that exclude each of the industries identified in Table 2 at a time to mitigate concerns of one particular industry driving the main results. Results from these tests do not indicate differences in the inferences drawn from the results using the full sample.

6.3.5. Multicollinearity issues

I computed variance inflation factors (VIFs) for all the estimations of Eq. (5) presented in the paper and found that *ppeta* and ln(*ta*) presented VIFs larger than five. To mitigate concerns about multicollinearity affecting the statistical tests, I estimated Eq. (5) while including only one of the problematic variables at a time as well as substituting *ppeta* with

[28] The inferences from the results in Table 8 are not affected when industry (instead of firm-specific) fixed effects and the *weak_gov* linear term are included in equation 5.

Table 7
Fixed effects regressions examining the effect of tax environment changes and governance on tax avoidance using alternative definitions of weak governance.

Panel A: Dependent variable is permanent book-tax difference (*permbtd*)

Independent variables	Column 1			Column 2	
	Pred. sign	Param. estimate	t-stat	Param. estimate	t-stat
postΔreg	+/−	0.013 ***	3.495	0.011 ***	2.947
weak 8_gov × post Δ reg	−	−0.009 **	−1.691	−	−
weakm_gov × post Δ reg	−	−	−	−0.003	−0.589
ppe	+	0.029 **	2.170	0.030 **	2.201
chgpostret	−	−1.204 ***	−2.825	−1.238 ***	−2.914
salesgrowth	+	0.018 **	2.028	0.018 **	2.045
intang	+	0.018	1.007	0.018	1.017
uncon	+/−	−0.309	−0.623	−0.298	−0.597
statetax	+/−	0.527	1.013	0.514	0.987
opercashflow	+	0.065 **	1.878	0.066 **	1.920
mtr	+	−0.005	−0.308	−0.004	−0.256
r &d	+/−	−0.574 ***	−4.234	−0.573 ***	−4.204
leverage	+/−	−0.040	−1.538	−0.039	−1.524
foreign	+	0.002 *	1.539	0.002 *	1.561
daccr	+	0.003	0.871	0.002	0.857
analystcov	+	0.304	1.005	0.285	0.938
epsgrowth	+	0.009 *	1.648	0.009 **	1.664
ln(*ta*)	+/−	0.001	0.227	0.001	0.144
Adjusted R2		0.084		0.083	
F		5.608		5.582	
Pr > F		< 0.001		< 0.001	

Panel B: Dependent variable is cash effective tax rate (*cashetr*)

Independent variables	Pred. sign	Param. estimate	t-stat	Param. estimate	t-stat
postΔreg	+/−	−0.040 **	−2.428	−0.040 **	−2.242
weak 8_gov × post Δ reg	+	0.053 **	2.260 **	−	−
weakm_gov × post Δ reg	+	−	−	0.047	2.021
ppe	−	−0.065	−1.039	−0.070	−1.126
chgpostret	+	4.021 *	1.511	4.324 *	1.635
salesgrowth	−	−0.077 **	−1.748	−0.077 **	−1.746
intang	−	−0.095 *	−1.374	−0.091 *	−1.302
uncon	+/−	−7.540 ***	−3.485	−7.578 ***	−3.523
statetax	+/−	2.749 *	1.664	2.751 *	1.654
opercashflow	−	−0.728 ***	−6.276	−0.729 ***	−6.288
mtr	−	0.125 **	1.858	0.121 **	1.797
r &d	+/−	2.150 ***	5.703	2.132 ***	5.583
leverage	+/−	0.269 ***	3.338	0.262 ***	3.228
foreign	−	−0.002	−0.251	−0.002	−0.289
daccr	−	−0.016	−1.247	−0.016	−1.209
analystcov	−	0.311	0.308	0.433	0.425
epsgrowth	−	−0.044 ***	−2.617	−0.045 ***	−2.673
ln(*ta*)	+/−	−0.032	−1.333	−0.031	−1.302
Adjusted R2		0.110		0.110	
F		10.780		9.943	
Pr > F		< 0.001		< 0.001	

Variables are defined in Appendix B. ***, **, * Indicate significance at the 1, 5 and 10% levels, based on clustered-robust standard errors at the firm-level (two-sided if no sign is predicted). Sample period is 1997–2000 (low-regulation) and 2003–2005 (high-regulation). Sample size is 2569 firm-years. All continuous variables are winzorized at the first and 99th percentiles. The *weak8_gov* corporate governance measure uses a modified *govscore* that includes audit committee independence as the only audit committee attribute in the score. The variable *weak8_gov* is set to one if a firm's modified governance score is three or less for the last two years in the low-regulation period; *weak8_gov* is set to zero otherwise. The *weakm_gov* corporate governance measure uses the median of the distribution of *govscore* as cutoff. The variable *weakm_gov* is set to one if the firm's *govscore* is five or less in the last two years of the low-regulation period; *weakm_gov* is set to zero otherwise. Firm-specific fixed-effects are included in all estimations.

Table 8
Fixed effects regressions examining the effect of tax environment changes and governance on tax avoidance using alternative definitions of the regulatory periods.

Panel A: Low-regulation period is 1997–2000 and high-regulation period is 2003–2006 (n = 2766)

	Column 1			Column 2		
Dependent variable:	*permbtd*			*cashetr*		
Independent variables	Pred. sign	Param. estimate	t-stat	Pred. sign	Param. estimate	t-stat
postΔreg	+/−	0.012 ***	3.570	+/−	−0.034 **	−2.303
weak_gov × post Δ reg	−	−0.014 **	−2.127	+	0.057 **	2.086
ppe	+	0.024 **	2.002	−	−0.057	−1.008
chgpostret	−	−0.367	−0.935	+	2.493	1.506
salesgrowth	+	0.018 **	2.115	−	−0.088 **	−2.057
intang	+	0.016	1.022	−	−0.081	−1.240
uncon	+/−	−0.139	−0.309	+/−	−8.139 ***	−3.777
statetax	+/−	0.014	0.025	+/−	3.514 *	1.683
opercashflow	+	0.068 **	2.114	−	−0.735 ***	−6.455
mtr	+	0.003	0.199	−	0.088	1.408
r &d	+/−	−0.606 ***	−5.534	+/−	2.301 ***	6.613
leverage	+/−	−0.037 *	−1.700	+/−	0.229 ***	2.975
foreign	+	0.002 **	2.016	−	−0.001	−0.247
daccr	+	0.003	0.996	−	−0.014	−1.107
analystcov	+	0.307	1.087	−	0.174	0.193
epsgrowth	+	0.002	0.470	−	0.013	0.837
ln(*ta*)	+/−	0.000	0.047	+/−	−0.009	−0.746
Adjusted R2		0.088				0.112
F		6.169				11.485
Pr > F		< 0.001				< 0.001

Panel B: Low-regulation period is 1997–1999 and high-regulation period is 2003–2006 (n = 2185)

Dependent variable:	*permbtd*			*cashetr*		
Independent variables	Sign	Estimate	t-stat	Sign	Estimate	t-stat
postΔreg	+/−	0.015 ***	3.623	+/−	−0.045 **	−2.556
weak_gov × post Δ reg	−	−0.014 **	−2.059	+	0.066 **	2.216
ppe	+	0.027 **	1.920	−	−0.067	−1.039
chgpostret	−	−1.039 **	−2.014	+	6.356 **	2.145
salesgrowth	+	0.013	1.077	−	−0.075	−1.477
intang	+	0.011	0.582	−	−0.136 *	−1.824
uncon	+/−	−0.575	−0.850	+/−	−8.378 ***	−3.316
statetax	+/−	0.555	1.023	+/−	3.325 **	2.018
opercashflow	+	0.056 *	1.370	−	−0.784 ***	−6.160
mtr	+	0.006	0.311	−	0.106	1.419
r &d	+/−	−0.577 ***	−3.769	+/−	2.081 ***	4.949
leverage	+/−	−0.026	−0.852	+/−	0.272 ***	3.026
foreign	+	0.002 **	1.749	−	−0.001	−0.137
daccr	+	0.002	0.760	−	−0.013	−0.952
analystcov	+	0.158	0.496	−	−0.151	−0.143
epsgrowth	+	0.013 **	2.018	−	−0.035 *	−1.779
ln(*ta*)	+/−	−0.002	−0.383	+/−	−0.028	−1.076
uncon	+/−	−0.575	−0.850	+/−	−8.378 ***	−3.316
statetax	+/−	0.555	1.023	+/−	3.325 **	2.018
opercashflow	+	0.056 *	1.370	−	−0.784 ***	−6.160
mtr	+	0.006	0.311	−	0.106	1.419
r &d	+/−	−0.577 ***	−3.769	+/−	2.081 ***	4.949
leverage	+/−	−0.026	−0.852	+/−	0.272 ***	3.026
foreign	+	0.002 **	1.749	−	−0.001	−0.137
daccr	+	0.002	0.760	−	−0.013	−0.952
analystcov	+	0.158	0.496	−	−0.151	−0.143
epsgrowth	+	0.013 **	2.018	−	−0.035 *	−1.779
ln(*ta*)	+/−	−0.002	−0.383	+/−	−0.028	−1.076

(*continued on next page*)

Table 8 (*continued*)

Adjusted R2	0.070	0.112
F	4.270	10.355
Pr > F	< 0.001	< 0.001

Panel C: Low-regulation period is 1997–2000 and high-regulation period is 2004–2007 (n = 2582)

Dependent variable:	*permbtd*			*cashetr*		
Independent variables	sign	estimate	t-stat	sign	estimate	t-stat
postΔreg	+/−	0.008 *	1.933	+/−	−0.035 **	−1.988
weak_gov × post Δ reg	−	−0.015 **	−1.777	+	0.056 *	1.731
ppe	+	0.000	0.000	−	0.000	0.000
chgpostret	−	−0.098	−0.224	+	0.099	0.058
salesgrowth	+	0.031 ***	3.372	−	−0.101 **	−2.324
intang	+	0.024 *	1.429	−	−0.017	−0.274
uncon	+/−	0.166	0.298	+/−	−5.474 **	−2.521
statetax	+/−	1.669 **	2.361	+/−	9.029 ***	3.723
opercashflow	+	0.129 ***	3.148	−	−0.607 ***	−4.945
mtr	+	−0.001	−0.037	−	0.095	1.495
r &d	+/−	−0.595 ***	−4.844	+/−	2.244 ***	6.837
leverage	+/−	−0.063 ***	−2.986	+/−	0.126	1.607
foreign	+	0.002 *	1.518	−	−0.005	−1.030
daccr	+	0.004	1.164	−	−0.020	−1.329
analystcov	+	0.551 **	1.811	−	1.272	1.183
epsgrowth	+	0.001	0.159	−	0.059 ***	3.555
ln(*ta*)	+/−	0.000	−0.158	+/−	0.000	0.032
Adjusted R2		0.203				0.235
F		5.547				12.569
Pr > F		< 0.001				< 0.001

Variables are defined in Appendix B. ***, **, * Indicate significance at the 1, 5 and 10% levels, based on clustered-robust standard errors at the firm-level (two-sided if no sign is predicted). All continuous variables are winzorized at the first and 99th percentiles. Firm-specific fixed-effects are included in all estimations.

the level of depreciation scaled by total assets. Inferences from these estimations are similar to those presented in Tables 5 and 6 and the resulting VIFs do not suggest multicollinearity problems.

7. Conclusions and limitations

I examine how firms' tax avoidance levels were affected by the external monitoring changes of the early 2000s given firms' governance strength prior to the changes (the low-regulation period). Results indicate weakly governed firms exhibit lower tax avoidance levels than other firms in the sample during the high-regulation period. The results suggest that the regulatory regime changes of the early 2000s increased external monitoring and induced firms that were previously weakly governed to improve their internal functions and identify areas of tax risk that needed adjusting resulting in lower tax avoidance levels relative to other firms. The results also suggest a reduction in managers' opportunities to use tax avoidance for short-term firm profitability goals because of the increased scrutiny by regulators and the public.

The study contributes to our understanding of the relationship between tax avoidance and corporate governance. By focusing on the period after the regulatory changes of the early 2000s, the study adds to the findings that support a link between weak corporate governance and tax avoidance. An important feature of my study is that the corporate governance effects documented herein are based on a comprehensive corporate governance score that captures the complexity of the corporate governance construct. In contrast, other studies in this stream of literature (e.g., Armstrong et al., 2015; Blaylock, 2016; Seidman & Stomberg, 2017) use single or disaggregated measures of corporate governance that may fail to capture the multi-dimensional aspects firms' corporate governance structures. The study also furthers our understanding of moderating effect of firms' external monitoring environment on the effect of corporate governance on tax avoidance. As such, the study highlights the importance of considering the strength of both external and internal monitoring structures when analyzing the impact of changes in regulation on tax avoidance.

The results are subject to several limitations. First, financial statement data are used to infer tax avoidance introducing measurement error to the analyses. Second, corporate governance measures are far from perfect and partitioning firms into two groups assumes the researcher knows the exact cut-off that identifies weakly governed firms for each measure. Third, parameter estimates generalize only to large firms surviving from 1997 to 2005. Nonetheless, this may be a lesser concern because Mills, Newberry, and Trautman (2002) document that book-tax differences are more prevalent for larger firms.

Fourth, the study does not explicitly control for the endogeneity of

accounting choices other than through the use of fixed effects to control for firm-specific unobserved heterogeneity. The FE would mitigate endogeneity concerns only if accounting choices are determined by time-invariant firm-specific factors. Remaining endogeneity issues are not easily dealt with because the financial statement data generating process makes it difficult to obtain valid instruments for each variable in the model that would be uncorrelated with the error term. Last, it is empirically impossible to completely distinguish whether the IRS and Congress tax enforcement efforts or the corporate governance reform (i.e., SOX) carry the weight of the external monitoring changes analyzed in the study. However, the analysis suggests that the interplay between internal and external governance structures significantly affected weakly governed firms' tax avoidance levels during the high-regulation period.

Appendix A

I construct the *govscore* combining attributes of the BOD, the AC, the G-Index and the PIH identified by prior studies as indicators of corporate governance strength. Indicator variables identifying the conditions that indicate a strong-governance environment for each attribute are defined as follows:

A.1. BOD attributes

- Independence—Prior research argues outside or independent directors have more incentives to carry out their monitoring tasks (Fama & Jensen, 1983) than other members of the board. Although evidence on the effects of BOD's independence is mixed, the widespread view suggests a higher proportion of outside directors is associated with strong-governance and financial statement integrity (e.g., Collins, Gong, & Li, 2009; Dechow, Sloan, & Sweeney, 1996), lower tax avoidance (Lanis & Richardson, 2011) and mitigating factor on the negative performance effects of CEO Duality (Duru, Iyengar, & Zampelli, 2016). An outside director is identified as a director with no significant affiliations with the firm (e.g., firm employees, providers of services, major customers). Following prior studies an indicator variable is equaled to one if 60% or more of a firm's directors are outsiders (DeFond et al., 2005; Dhaliwal, Naiker, & Navissi, 2010); zero otherwise.
- CEO-Chair Separation—Jensen (1993) suggests the position of CEO and Chair of the BOD should be separated because a critical function of the later is to oversee the performance of the former. Existing empirical evidence suggests an association between *Duality* (i.e., CEO and Chairman of the BOD held by the same person) and higher instances of Securities Exchange Commission (SEC) accounting enforcement actions (Dechow et al., 1996) and lower firm performance (Duru et al., 2016). An indicator variable is equaled to one for firms without *Duality*; zero otherwise.
- Blockholder—Prior studies document that BOD's members who are blockholders improve corporate governance through better external monitoring (Beasley, 1996; Dechow et al., 1996; Klein, 2002). Therefore, an indicator variable is equaled to one for firms where at least one director owns > 5% of the firm's outstanding shares; zero otherwise.
- BOD experience—A BOD member's monitoring ability increases with experience on boards (Fama, 1980). Prior research finds a negative association between outside directorships and aggressive financial reporting (Bedard, Marakchi-Chtourou, & Courteau, 2004). An indicator variable is equaled to one if the average number of directorships held by firms' board members is greater than two; zero otherwise.
- Attendance—The level of commitment of members of the BOD is important for effective monitoring. Brown and Caylor (2006) documents one of the key drivers of the relation between governance strength and firm valuation is that all directors attend > 75% of board meetings. Building on that finding, an indicator variable is equaled to one if all firm's directors attended at least 75% of the board's meetings; zero otherwise.

A.2. AC attributes

- AC size—Effective December 1999, and following the recommendations of the Blue Ribbon Committee (BRC, 1999), the New York Stock Exchange (NYSE) and NASDAQ required their registrants to have a minimum of three directors on their AC, suggesting that larger AC provide stronger governance. Anderson, Mansi, and Reed (2004) provides evidence consistent with larger AC being associated with lower cost of debt. Therefore, an indicator variable is equaled to one if a firm's AC has at least three members; zero otherwise.
- AC independence—Firms with more independent AC are less likely to experience fraud, SEC enforcement actions, material restatements, and earnings management than those with less independent AC (Abbott, Parker, & Peters, 2004; Bedard et al., 2004; Klein, 2002). Also, the BRC recommended all large listed companies should have AC composed entirely of independent directors. Therefore, an indicator variable is equaled to one if a firm's AC is composed of independent directors; zero otherwise.
- AC governance expertise—Companies with an AC with expertise in corporate governance are more likely to support auditors in management-auditor disputes, and less likely to engage in earnings management (Carcello & Neal, 2003; Yang & Krishnan, 2005). Bedard et al. (2004) document a negative association between the number of directorships an AC member holds and the incidence of earnings management. An indicator variable is equaled to one if the average number of outside directorships held by a firm's AC's members exceeds one; zero otherwise.

A.3. Shareholders rights

- G-Index—I use Gompers et al.'s (2003) shareholder rights index as a measure of shareholders' legal protection. Gompers et al. (2003) document a positive relation between strong-governance and firms' performance. An indicator variable that equals one if the G-index is less or equal to six; zero otherwise. The partitioning scheme compares to Gompers et al.'s (2003) democracy classification and intends to identify firms with the highest level of shareholder protection.[29]

A.4. Sophisticated investors monitoring

- Percentage of Institutional Holdings (PIH)—Prior research suggests institutional investors are an important part of the corporate governance

[29] Ninety three percent of the sample uses the G-Index for the period 1998–2000; the remaining 7% use the G-Index for the period 2000–2002 (assessed in February 2000). The observations below the cut-off represent 23% of the observations in the low-regulation period.

system because they are able to monitor firms' management and policies in an unbiased way and have the voting power to put pressure on management if they observe self-serving behavior (e.g., Cremers & Nair, 2005; Jensen, 1993; McConnell & Servaes, 1990; Schleifer & Vishny, 1997). I define an indicator variable that equals one for each of the available firm-years in the low-regulation period if the observation fell within the top two deciles of the percentage of institutional investors' shareholdings. This partitioning scheme aims to identify firms with high levels of monitoring by institutional investors.

For each firm-year in the sample, I calculate *govscore* by adding the ten indicator variables belonging to each corporate governance characteristic. I identify a firm as weakly governed during the low-regulation if its *govscore* is four or less and set *weak_gov* to one if the firm has a *govscore* of four or less for years 1999 and 2000; *weak_gov* is set zero otherwise.[30]

Table A1 Panel A reports the descriptive statistics on the BOD's, AC's and other attributes used to calculate the *govscore* for the period 1999–2000. The data in Table A1 is similar to that from earlier studies (e.g., Dhaliwal et al., 2010; Minnick & Noga, 2010; Wintoki et al., 2012; Xie, Davidson, & DaDalt, 2003; Yang & Krishnan, 2005). The mean (median) *govscore* is 4.59 (5.00) and < 25% of the sample fell below the cut-off used to identify weak-governance firms (1st quartile was 4). A noticeable difference from earlier studies is the percentage of firms without *Duality*, which was 65% for my sample, compared with 42% for Dhaliwal et al. (2010) and 15% for Xie et al. (2003). Distributional characteristics of the AC's percentage of independent members and size resemble those recommended by the BRC, which was probably a result of the adoption of those recommendations by NASDAQ and the NYSE in 1999. The distribution of the G-Index for the sample reveal a mean G-Index of 8.94 for the years in the low-regulation period, consistent with Gompers et al. (2003).

Panel B of Table A1 reports the correlations among the components of the corporate governance score. Although several correlation coefficients are positive and significant, the correlations do not suggest that each attribute represent the same dimension of a firm's corporate governance structure. Of particular interest are the correlations reported for the percentage of directors that are blockholders and G-Index. The correlations of most variables and the percentage of directors that are blockholders are negative and significant, which may indicate that firms with directors who are blockholders may relax other corporate governance mechanisms because of the external monitoring that those blockholders exercise. Several of the correlations of the shareholder protection index (G-Index) with other corporate governance attributes are positive and significant suggesting a positive association between strong governance and higher values of the G-Index. Although counterintuitive, this may indicate that firms with low shareholder protection use other corporate governance mechanisms to protect the interests of their shareholders.

Table A1
Descriptive statistics of firm's corporate governance attributes.

Panel A: Descriptive statistics of governance score (*govscore*) components

Variables	Mean	Std. Dev.	First quartile	Median	Third quartile
govscore	4.590	1.452	4.000	5.000	6.000
BOD % Independent Directors	0.586	0.193	0.444	0.600	0.750
CEO-Chair Separation	0.645	0.479	0.000	1.000	1.000
% BOD Blockholders	0.066	0.113	0.000	0.000	0.111
% BOD with Director Experience	0.239	0.218	0.000	0.200	0.400
% BOD with Low Meeting Attendance	0.024	0.053	0.000	0.000	0.000
AC size	3.670	1.233	3.000	3.000	4.000
AC % Independent Directors	0.806	0.233	0.667	0.833	1.000
% AC with Director Experience	0.279	0.342	0.063	0.222	0.389
G-Index	8.937	2.828	7.000	9.000	11.000
% Institutional Holders	0.666	0.208	0.519	0.679	0.806

Panel B: Pearson correlation coefficients governance score (*govscore*) components.

Variables		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
BOD % Independent Directors	(1)	1.000									
CEO-Chair Separation	(2)	**0.106**	1.000								
% BOD Blockholders	(3)	**−0.475**	−0.050	1.000							
% BOD with Director Experience	(4)	**0.396**	**0.180**	**−0.341**	1.000						
% BOD with Low Meeting Attendance	(5)	0.059	0.032	−0.024	**0.142**	1.000					
AC size	(6)	**0.293**	**0.111**	**−0.277**	**0.366**	0.022	1.000				
AC % Independent Directors	(7)	**0.626**	0.014	**−0.351**	**0.196**	0.080	**0.126**	1.000			
% AC with Director Experience	(8)	**0.316**	**0.139**	**−0.272**	**0.674**	**0.114**	**0.263**	**0.230**	1.000		
G-Index	(9)	**0.344**	0.057	**−0.349**	**0.298**	0.042	**0.327**	**0.201**	**0.198**	1.000	
% Institutional Holders	(10)	**0.204**	0.080	**−0.247**	**0.103**	−0.048	−0.054	0.105	0.075	0.036	1.000

Variables are the corporate governance attributes included in the corporate governance index as described in Appendix 0. Attributes measured for years 1999–2000 in the low-regulation period. In panel B, bold numbers represent significant correlations at the 5% level or better.

[30] If *govscore* is not available for both years 1999 and 2000, I use the *govscore* for 1998 and 1999, if available, to define *weak_gov*. Otherwise, the *govscore* for year 1999 or 2000 is used to define *weak_gov*.

Appendix B. Variable measurement

Variable name	Definition
postΔreg	Indicator variable equal to 1 if year ≥2003; zero otherwise.
Tax avoidance	
permbtd	{*btd* – [(federal deferred tax expense + foreign deferred tax expense)/top statutory rate]} scaled by lagged total assets.
totbtd	{[pre-tax income − minority interests] − *taxinc*}.
taxinc	{[federal current income tax + foreign current income tax] / top statutory rate} − change in net operating losses.
cashetr	Income tax paid divided by pre-tax income; if income tax paid is negative, then *cashetr* = 0; if income tax paid is greater than 0 and pre-tax income is negative, then *cashetr* = 1; any remaining observations where *cashetr* > 1 are reset to 1.
Governance	
weak_gov	Indicator variable equaled to one if *govscore* is four or less; 0 otherwise for firm *i* in years 1999 and 2000; *govscore* based on the combination of the ten attributes of the BOD and AC, the G-Index, and deciles of *pih*. See Appendix 0.
w_impr	Indicator variable equaled to 1 if *govscore* is four or less in the low-regulation period and *govscore* is five or more in the high-regulation period; zero otherwise.
Control variables	
ppe	Gross PPE scaled by lagged total assets.
chgpostret	Change in post-retirement benefits from year *t-1* to year *t* scaled by lagged total assets; set to zero if missing and multiplied by -1 for ease of interpretation of the coefficient (Manzon and Plesko 2002).
salesgrowth	Change in net sales divided by lagged net sales.
intang	Goodwill and other intangibles scaled by lagged total assets.
uncon	Income (loss) reported under the equity method scaled by lagged total assets.
statetax	Current state income tax expense scaled by lagged total assets.
opercashflow	Operating cash flows scaled by lagged total assets.
mtr	Lagged estimated marginal tax rates (Graham 1996); estimates from Professor John Graham's Web Site.
r&d	Ratio of R&D expenses to sales; set to zero if missing.
leverage	Long-term debt/total assets.
foreign	Number of countries in which firm *i* operated during year *t*; COMPUSTAT Geographic Segment data file.
daccr	Residual from the cross-sectional modified Jones (1991) model (Dechow et al. 1995) using all available data in COMPUSTAT data for years 1996–2005.
analystcov	Number of analysts in the I/B/E/S database issuing annual earnings per share (EPS) estimates for firm *i* in year *t* scaled by lagged total assets.
epsgrowth	Equals one if the annual change in EPS is within +/− $0.05; zero otherwise.
ln(*ta*)	Natural log of total assets.

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