Does inside debt moderate corporate tax avoidance?

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ABSTRACT:

Theory suggests that inside debt held by executives in the form of deferred compensation and unfunded pensions mitigates agency problems within the firm by altering the risk preferences of managers. We investigate whether the inside debt of the chief executive officer (CEO) or chief financial officer (CFO) is associated with reduced corporate tax avoidance. We measure tax avoidance using effective tax rates and a measure of discretionary tax avoidance for a large sample of public companies dating from 2006. Consistent with the conjecture that inside debt mitigates risky behavior for executives with a high level of financial sophistication, we find that the level of inside debt for the CFO, but not CEO, is associated with reduced tax avoidance. Our results are robust to numerous supplemental tests, including instrumental variables estimation and propensity score matching. Further subsample tests reveal this relation is stronger for firms with greater default likelihood. Overall, our results suggest that inside debt held by the CFO mitigates tax avoidance.

Keywords: *Tax risk; tax avoidance; inside debt; executive compensation; CFO incentives*

JEL classification: G32, H25, M41, J33

Does inside debt constrain corporate tax avoidance?

1. Introduction

Shareholders benefit from corporate tax avoidance to the extent that a reduction in income taxes increases reported income and cash flow. Corporate executives also benefit from corporate tax avoidance through increased remuneration and participation in share appreciation from equity-based compensation. However, avoiding corporate income taxes entails risks (Hasan et al., 2013), and we have an incomplete understanding of the extent to which executives are sensitive to these risks (Hanlon and Heitzman, 2010; Gallemore et al., 2013; Graham et al., 2013). For example, empirical tests of a relation between executive risk-based incentives and tax avoidance has yielded mixed results (Desai and Dharmapala, 2006; Armstrong et al., 2012: Rego and Wilson, 2012; Gaertner, 2013; Powers et al., 2014). In this paper, we approach the relation between tax avoidance and executive incentives from a different direction. Specifically, we investigate whether inside debt held by management moderates their appetite for corporate tax avoidance, after controlling for the other elements of executive compensation.

Managers hold inside debt in the form of executive pensions and deferred compensation, and these obligations are typically unfunded and unsecured. Hence, inside debt provides executives with an incentive to take actions to avoid bankruptcy and maximize the firm's liquidation value conditional on bankruptcy. Jenson and Meckling (1976) describe the potential effectiveness of inside debt to control the creditor-manager agency problems, and Edmans and Liu (2011) formalize this relation. They show that a mixture of inside debt and equity-based compensation provides executives with motivation to manage firm value, instead of managing equity value at the expense of existing creditors. Recent studies examining inside debt document a link between inside debt and conservative investment activities and financing outcomes. For example, Cassell

et al. (2012) (hereafter "CHSS") find that managers with compensation that is sensitive to the value of inside debt pursue less R&D and tend to manage firms with lower stock return volatility. Other researchers document a link between inside debt and default probability (Sundaram and Yermack, 2007), bond values (Wei and Yermack, 2011), and private loan features such as covenants, syndicate structure, security, and loan pricing (Anantharaman et al., 2013; Wang et al., 2013). These results are consistent with inside debt mitigating management's enthusiasm for risk.

Researchers have characterized corporate tax avoidance as a risky activity (Hanlon and Heitzman, 2010). Tax avoidance can produce immediate benefits, but the attendant costs can also be significant, and few corporate managers have sufficient tax expertise to appreciate these costs (Dyreng et al., 2010). Thus, managers engaged in tax avoidance must allocate resources to tax accountants, consultants, and attorneys to manage the firm's tax liability and to defend the tax avoidance strategies from challenges by the Internal Revenue Service and corporate auditors. Besides administrative costs, penalties plus interest levied on firms publicly identified as engaging in tax sheltering activities are very significant (Wilson, 2009). Indeed, Hanlon and Slemrod (2009) document negative stock price reactions to a public announcement that a firm has invested in tax shelters. Managers also face potential reputational fallout from IRS sanctions (Gallemore et al., 2013; Graham et al., 2013), and theoretical results recommend that enforcement sanctions focus on the manager (Crocker and Slemrod, 2005). Finally, Desai and Dharmapala, (2006, 2009b) argue that tax avoidance can be used by management to cultivate rent extraction. Thus, non-tax costs of tax avoidance are potentially significant (Hasan et al., 2013).

We evaluate the association between executive inside debt and tax avoidance using a sample of observations with complete compensation data over the period 2007-2012. Following recent studies, we predict that inside debt mitigates executives' preferences for tax avoidance. In addition, recent research provides evidence suggesting that the incentives of the CFO are more influential than the incentives of the CEO in settings where financial expertise is required (Chava and Purnanandam, 2007; Jiang et al., 2010; Anatharaman and Lee, 2013). Because formulating corporate tax strategy requires a high level of financial sophistication, we also test whether tax avoidance is associated with the inside debt held by the CEO or the CFO. We use three common empirical measures to identify firms pursuing tax avoidance activities, and the results are consistent with the theoretical predictions of the importance of inside debt for moderating risky activities. Our results also indicate that the association between tax avoidance and inside debt is significant for the CFO, but not for the CEO. This result is consistent with the notion that because tax avoidance requires a high level of financial sophistication, the determination and supervision of tax strategies are most likely to fall under the purview of the CFO.[1] We find these results to be economically meaningful. For example, in one specification, after controlling for pre-existing tax avoidance opportunities and the debt-equity compensation of the executive, we find that an increase of one standard deviation in CFO inside debt is associated with approximately $3.5 million higher income tax expense and $6 million higher cash taxes paid.

We also examine whether the relation between CFO inside debt is moderated by the firm's proximity to distress. We measure proximity to distress following Campbell, Hilscher and Szilagyi (2008) and Anantharaman and Lee (2014) as the distance to default, multiplied by -1, as

[1] In contemporaneous work, Chi, Huang, and Sanchez (2014) find some evidence that the inside debt of the CEO mitigates tax avoidance. Unlike their study, we examine the extent to which the inside debt held by the CFO, in addition to the CEO, has a mitigating effect on tax avoidance. We find robust evidence that the CFO's inside debt is the dominant force in mitigating tax avoidance. Moreover, and contrary to Chi et al., we find the inside debt of the CEO has little to no influence on tax avoidance.

our measure of distress risk. We then augment our regression models to include this variable and interact it with inside debt, the idea being that inside debt should have a stronger effect for firms with greater default risk. We find evidence that the main effect of inside debt continues to hold and that the interaction between inside debt and distress risk is significant, suggesting that distress risk partially moderates the relation between inside debt and tax avoidance.

We recognize that the construction of executive compensation is likely endogenous to many financial decisions. Executives and shareholders (via their representatives on the board and compensation consultants) negotiate executive compensation arrangements, including deferred compensation and pension benefits, given the firm's information environment and potential agency problems. For example, inside debt could be used to address certain agency costs, and thus, inside debt could be more prevalent with firms having higher agency costs of debt. Moreover, firms with high leverage might have less incentive to avoid taxes because interest tax shields can substitute for tax avoidance strategies (Graham and Tucker, 2006). We employ several empirical strategies to address the potential for endogeneity. First, we explicitly control for leverage and other determinants of tax avoidance that can be correlated with the agency costs of debt and tax avoidance activities. These other controls include proxies for the firm's historical investment and financing policies as well as future investment opportunities. Second, we endogenize our measures of inside debt via a two-stage least squares (2SLS) estimation in order to address potential simultaneity between the level of inside debt and tax avoidance. Overall, our main results are robust to these controls for alternative explanations and endogeneity. Third, we implement propensity score matching to estimate the sample average treatment effect on measures of tax avoidance where the treated firms are those for which the manager has an inside debt–to-equity ratio exceeding that of the firm.

This research compliments Jiang et al. (2010) who report that CFO equity incentives are more important than CEO incentives in determining earnings management. Our results also lend credibility to Anantharaman and Lee (2014) who report that CFO incentives are also strongly associated with pension underfunding and risky choice of pension assets, except where the CFO's personal stake in the pension is high. In addition, our paper also contributes to several other related strands of literature. First, our work extends the prior literature on agency costs and the impact of managerial compensation on corporate investment and financing policies. Our work also adds to the literature that focuses on the importance of managers for tax avoidance. Dyreng et al. (2010) established that managers were important for the tax strategies pursued, and Rego and Wilson (2012) find that equity-based managerial wealth increases in the volatility-attendant tax risk. Our work builds upon the theory of Edmans and Liu (2011) by providing evidence that inside debt moderates the manager's incentive to pursue tax risk. Third, our work highlights the importance of increased focus on the CFO's incentives for investment and financing decisions, particularly when the decision involves sophisticated financial strategies such as those employed with tax avoidance.

The paper proceeds as follows. Section 2 provides additional background and motivates our hypotheses. Section 3 discusses the sample and the empirical strategy. Section 4 presents the results, and section 5 concludes.

2. Related literature and hypothesis development

Hanlon and Heitzman (2010) review the literature on tax avoidance and comment on the absence of evidence on the effect of executives and agency considerations on tax avoidance. This echoes the call in Shackelford and Shevlin (2001) and Weisbach (2002) for examination of the determinants of cross sectional variation in tax avoidance. Hanlon and Heitzman (2010) mention

that the "separation of ownership and control implies that if tax avoidance is a worthwhile activity, then the owners ought to structure appropriate incentives to ensure that managers make tax-efficient decisions" (Hanlon and Heitzman, 2010, p. 138). In support of this hypothesis, Rego and Wilson (2012) report a positive link between equity compensation incentives and tax avoidance.

Stock option compensation provides the manager with incentives to increase the volatility of cash flows, and prior research has provided evidence that managers respond to this incentive by altering investment and financing decisions. For example, Guay (1999) finds a positive association between the convexity of the CEO's incentive compensation and the firm's growth opportunities (i.e., risky investment). Rajgopal and Shevlin (2002) find a positive association between exploration risk and executive compensation risk incentives for a sample of firms in the oil and gas production industry. Coles et al. (2006) show that R&D (high-risk investment) is positively related to the vega of managerial options holdings.[2] Others show that managerial equity-based compensation can aggravate the manager-creditor agency costs of debt by providing the incentive to increase firm risk (DeFusco et al., 1990; John and John, 1993; Ortiz-Molina 2006; Billett et al., 2010).

Jensen and Meckling (1976) wrote that managerial inside debt, such as deferred compensation and pensions, align the incentives of managers with those of creditors. This is because inside debt is an unsecured and unfunded obligation and is likely discounted upon bankruptcy reorganization or liquidation. In equilibrium, shareholders shoulder the costs of the manager-creditor agency conflict because creditors will protect their claims via pricing,

[2] Option *delta* measures the change in the executive's option portfolio given a 1% increase in stock price, whereas option *vega* measures the change in the executives' option portfolio given a 0.01 unit increase in volatility. Hence, option *vega* is more directly related to risk (Coles et al., 2006; Brockman et al., 2010; Armstrong et al., 2013).

covenants, collateral, and monitoring mechanisms. Edmans and Liu (2011) formally model the optimal compensation contract, and confirm the Jensen and Meckling (1976) intuition – inside debt can mitigate the agency costs of debt because it provides the manager with the incentive to avoid bankruptcy and to increase firm liquidation value conditional on bankruptcy.

Recent research has provided empirical evidence consistent with the Edmans and Liu (2011) theory. For example, CHSS show that firm risk (e.g., equity volatility and R&D outlays) is negatively associated with managerial inside debt. Previously Sundaram and Yermack (2007) reported a positive association between CEO inside debt holdings and the distance to default. Wei and Yermack (2011) find that initial disclosures of CEO inside debt positions (in early 2007) generated increases in existing bond prices, decreases in equity prices, and decreased volatility for both types of securities. Wang et al. (2013) measure inside debt using CEO's percentage ownership of firm debt relative to her percentage ownership of firm equity. They report a negative association between conservatism and debt and explain that debt addresses agency issues thereby alleviating the need for conservatism.

2.1. Tax avoidance and risk

Hasan et al. (2013) provides a summary of the risks that accompany tax avoidance activities. First, there is information risk. Tax avoidance activities lack transparency, otherwise regulators and other tax authorities are likely to detect the practice (Balakrishnan et al., 2012; Hope et al., 2013). A lack of transparency can act to insulate the manager from external market discipline, enabling managerial influence over reported earnings (Hanlon, 2005; Desai and Dharmapala, 2006; Frank et al., 2009) and firm news (Kim et al., 2011). Second, there is agency risk, perhaps magnified by the information risk engendered by tax avoidance activities. Desai and Dharmapala (2006) emphasize that the lack of transparency enables managerial rent diversion or perquisite

consumption. Desai and Dharmapala (2009a) find a positive association between firm value and tax avoidance among well-governed firms. Khurana and Moser (2013) find that the presence of institutional investors is associated with less tax avoidance activities, suggesting that external market disciplining mechanisms can control the behavior, consistent with a risk interpretation. In a similar vein, Chyz et al. (2013) posit that labor unions will capture some of the gains from tax avoidance, which mitigates managerial incentives to pursue tax avoidance strategies.

Third, and perhaps most compelling, there is the risk that Treasury will pursue the firm for its tax avoidance behavior. An Ernst and Young proposal for tax avoidance strategies, made to Wal-Mart in 2002, provides summaries of several strategies. The proposal describes several strategies as uncertain or risky in that the strategies embrace interpretation of the law that contradicts or expands the interpretation advocated by regulators. The memo specifically describes one recommendation as "a very aggressive strategy with considerable risk" (Drucker, 2007, p. A1). Research also supports this anecdotal evidence of enforcement risk. For example, Mills (1998) and Mills and Sansing (2000) find a positive association between IRS audit risk and tax avoidance.

2.2. Executives and tax avoidance

There is a growing stream of research providing evidence of substantial executive influence on corporate policies. Bertrand and Schoar (2003) find that executives have a significant influence on the investment and financing policies of the firms they manage. Bamber et al. (2010) find evidence that manager effects can explain cross-sectional variation in firm disclosure patterns. There is also evidence that executives influence corporate tax avoidance. Dyreng et al. (2010) track the movement of CEOs from one firm to the next and find that tax avoidance follows the executive (i.e., a CEO fixed effect). The authors posit that executives influence tax

avoidance through their “tone at the top.” Anecdotal evidence of this executive tone toward taxes is disclosed in deposition testimony following a challenge by North Carolina’s state attorney general (Drucker, 2007; Dyreng et al., 2010).

2.3. Executive compensation and tax avoidance

Empirical research on the connection between compensation and tax avoidance has provided mixed results. Powers et al. (2014) report evidence of lower ETRs among firms managed by CEOs compensated based on after-tax measures of performance. Gaertner (2013) finds a positive association between CEO cash compensation and the use of after-tax performance incentives. This is in contrast to results in Phillips (2003) who finds evidence based on survey data that lower ETRs are associated with after-tax performances measures for business-unit managers but not CEOs. Robinson et al. (2010) find greater tax avoidance among firms that manage and evaluate tax departments as “profit centers.”

Desai and Dharmapala (2006) find that equity compensation is associated with a reduction in tax avoidance for poorly governed firms. However, Hanlon et al. (2007) use a unique dataset containing confidential tax return data and IRS audits and appeals and find evidence that executive bonus and equity incentive compensation are positively associated with measures of tax avoidance, but not with measures of governance quality. Armstrong et al. (2010) also use a proprietary dataset and find that the incentive compensation of the firm’s tax director is negatively associated with ETR, but unrelated to other measures of tax avoidance. Motivated by the risky-nature interpretation of tax avoidance activities, Rego and Wilson (2012) examine the sensitivity of an executive’s option portfolio’s to an increase in volatility. They find that tax avoidance is positively associated with equity-based incentives to increase firm risk.

The connection between compensation and tax avoidance has theoretical justification. Crocker and Slemrod (2005) model the risk-neutral shareholder's problem of compensating the firm's risk-neutral CFO in a way that motivates tax avoidance. In their model, the CFO possesses superior information relative to shareholders on how the firm can minimize taxes. Their results show that the optimal compensation contract includes a bonus that is convex in the observed reductions in the tax liability. They also conclude that tax authorities should levy penalties on the tax manager when tax avoidance crosses the line over to tax evasion. This is because penalties on the CFO aggravate the shareholder-manager agency problem, and thus, reduce tax evasion more than does the same penalty levied onto the firm. An important takeaway is that theory agrees that shareholder-manager agency problems are important for tax avoidance, and that compensation policies for the tax manager providing risk incentives are effective. An externality is that the equity-based compensation used to induce tax risk will aggravate the creditor-shareholder agency problem, and theory shows that inside debt mitigates this problem.

2.4. Hypothesis

While there is evidence that executives matter for tax strategy, it is unclear whether the CEO, the CFO, or the tax director determines the overall tax strategy (Armstrong et al., 2012).[3] The conflicting results regarding the relation between CEO incentives and tax avoidance contrast with the evidence that business unit managers and tax directors respond to incentives for tax avoidance (Armstrong et al., 2012; Phillips, 2003; Robinson et al., 2010). Further, theory suggests that for decisions requiring financial sophistication, incentives and regulation should focus on the executive most likely to have decision rights: the CFO (Crocker and Slemrod,

[3] Ideally, we would like to measure the effect of inside debt on tax avoidance for each of these executives. However, available data limits our analysis to the top-five highest paid executive officers disclosed in the annual proxy filing (and tracked in the Execucomp database). We limit our analyses to the CEO and, particularly, the CFO as these individuals have the greatest influence in setting corporate tax policy.

2005). Consistent with this notion, Chava and Purnanandam (2010) find that, while incentives of the CEO play an important role in broad corporate policies, the incentives of the CFO influence more specialized financial policies such as debt maturity. Jiang et al. (2010) find a positive association between executive equity incentives and accrual management, but also find that this association is stronger for CFOs. Anatharaman and Lee (2014) find a positive association between pension underfunding (i.e., a form or risk shifting) and executive compensation vega, and that the estimated relation is stronger for the CFO vis-à-vis the CEO.[4] These results suggest that the CFO's compensation characteristics are an important consideration when examining the relation between executive incentives and specific financial policies and leads to our hypotheses stated in null form.

H1: Tax avoidance will not be negatively associated with the CEO's level of inside debt.

H2: Tax avoidance will not be negatively associated with the CFO's level of inside debt.

3. Sample, variable measurement, and empirical design

3.1. Sample

Our sample consists of 4,735 firm-year observations constructed primarily from the intersection of the Compustat and Execucomp databases spanning fiscal years 2007 through 2012.[5] We match fiscal year *t* inside debt measures with fiscal year *t+1* tax outcomes to measure the effect of inside debt on tax avoidance. Due to inherent regulatory and institutional differences, we omit utilities (two-digit SIC = 49) and financial firms (two-digit SIC = 60-69)

[4] Feng et al. (2011) analyze a sample of firms with material accounting manipulations and conclude that CFOs are pressured by CEOs (with higher equity compensation incentives) to manipulate the financial statements for immediate (CEO) personal financial benefit.

[5] Our sample begins in 2007 because data required to measure executive inside debt did not become available until 2006 (Regulation S-K), and because we match compensation data in fiscal year *t* with tax data in fiscal year *t+1*.

from our sample. Table 1 reports our sample distribution by time (Panel A) and industry (Panel B). Our sample selection procedures result in approximately 700-800 observations per year.[6]

---------- Insert Table 1 about here ----------

3.2. Variable measurement

3.2.1. Inside debt measures

We use three measures of inside debt in our analysis. We follow CHSS and measure inside debt as the ratio of the CEO's debt-to-equity ratio to the firm's debt-to-equity ratio. Unlike CHSS, we also measure the CFO's inside debt to test whether the CFO influences corporate tax avoidance:

$$CEO\ Debt = (CEO\ IDH/CEO\ EH)/(FD/FE) \quad (1a)$$

$$CFO\ Debt = (CFO\ IDH/CFO\ EH)/(FD/FE) \quad (1b)$$

We compute inside debt holdings (*IDH*) as the sum of the present value of pension benefits and deferred compensation. Equity holdings (*EH*) equal the value of stock and options held by the executive.[7] Firm debt (*FD*) equals total debt and firm equity (*FE*) equals the market capitalization as of fiscal year end. We also employ an indicator variable, *Hi CEO Debt* or *Hi CFO Debt*, which equals one if the executive's inside debt-to-equity ratio is greater than the firm's debt-to-equity ratio. Our expectation is that the effect of inside debt will be stronger when the executive's inside debt-to-equity ratio is greater than the firm's debt-to-equity ratio (Sundaram and Yermack, 2007; CHSS).

[6] Our time distribution is roughly consistent with CHSS who report approximately 1,000 observations per year. Our slightly smaller sample is primarily due to our tax-related data constraints (e.g., requiring positive pretax income, non-missing tax expense and cash taxes paid, omitting utilities and financials, etc.). If we relax these data constraints, we confirm our sample distribution is over 1,000 firms per year.

[7] Following CHSS, we partition equity holdings (*EH*) for each executive between stock and option components. Stock holdings include (exclude) restricted stock (options) and are valued by multiplying the fiscal year-end stock price by the number of shares held. Option holdings are valued using the Black-Sholes (1973) valuation formula, adjusted by Merton (1973) for dividends.

Our third measure of inside debt is based on Wei and Yermack (2011) and CHSS and measures inside debt as the 'relative incentive ratio' (*RelIncRatio*), which attempts to account for the duration and convexity of debt and equity claims:

$$CEO\ Debt = (\Delta CEO\ IDH/\Delta CEO\ EH)/(\ \Delta FD/\Delta FE) \quad (1c)$$

$$CFO\ Debt = (\Delta CFO\ IDH/\Delta CFO\ EH)/(\ \Delta FD/\Delta FE) \quad (1d)$$

Following Wei and Yermack (2011) and CHSS, ΔIDH and ΔFD are equal to total inside debt and total firm debt, respectively.[8] ΔEH equals total shares held by the executive (including restricted stock, but excluding options) plus option delta, thereby yielding an estimate of the executive's "total equity delta." Similarly, ΔFE equals total common shares outstanding plus employee stock option delta, thereby providing an estimate of a firm's "total equity delta."[9] We use these three measures of inside debt in our multivariate tests that follow.[10] Next, we describe the tax avoidance measures used in our multivariate tests.

3.2.2. Tax avoidance measures

We follow extant research and define tax avoidance as the explicit reduction in a firm's tax liability (Hanlon and Heitzman, 2010). We use three common proxies to measure tax avoidance: the book effective tax rate (*ETR*), the cash effective tax rate (*CETR*), and discretionary book-tax differences (*DTAX*). The book effective tax rate, *ETR*, equals total tax expense divided by pretax

[8] CHSS note that Wei and Yermack (2011) argue this simplifying assumption is necessary as the change in inside and firm debt are likely small and, due to limited information on firms' debt maturity structures, difficult to estimate.
[9] In computing ΔFE, we follow CHSS and use, when available, employee options outstanding (Compustat optosey), employee option exercise price (Compustat optprcby), and assume an expiration period of 4 years in computing the firm's option delta. Like CHSS, we acknowledge that these variables have limited data coverage.
[10] CHSS use a fourth measure of inside debt, the cash-adjusted relative incentive ratio, which adjusts the relative incentive ratio by the present value of future cash compensation. In this measure , the present value is determined by multiplying current cash compensation by the executive's "expected decision horizon,", which they empirically estimate as the difference between the industry median tenure and executive's tenure plus the difference between the median industry age and the executive's current age. Because we are examining the inside debt of the CFO (not just CEO) and there are many missing observations in estimating the "expected decision horizon," we choose not to use this measure in our study.

book income. The cash effective tax rate, *CETR*, equals cash taxes paid divided by pretax book income. We use effective tax rates (*ETR* and *CETR*) as proxies for tax avoidance because of their extensive use in the literature (Hanlon and Heitzman, 2010) and their saliency in the financial statements. In other words, if inside debt affects tax strategy then we expect to observe the effect through a firm's effective tax rate. We also use a measure of discretionary book-tax differences (*DTAX*) following Frank et al. (2009) to capture more aggressive forms of tax avoidance (McGuire et al., 2012; Armstrong et al., 2012).[11] To summarize, lower (higher) values of effective tax rates (*DTAX*) reflect greater tax avoidance. Thus, if our hypothesis is true, we expect, ceteris paribus, to observe higher effective tax rates (*ETR* and *CETR*) and lower discretionary book-tax differences (*DTAX*) in the presence of higher inside debt.

3.3. Empirical design

We estimate the following multivariate regression to test our hypothesis:

$$\begin{aligned} TAX_{i,t} = \quad & \alpha_0 + \alpha_1 Inside\ debt_{i,t-1} + \alpha_2 Delta_{i,t-1} + \alpha_3 Vega_{,t-1} \\ & + \alpha_4\ Comp_{i,t-1} + \alpha_5 ROA_{i,t} + \alpha_6 ACC_{i,t} \\ & + \alpha_7 SIZE_{i,t-1} + \alpha_8 FI_{i,t} + \alpha_9 EQINC_{i,t} + \alpha_{10} INTAN_{i,t} + \alpha_{11} PPE_{i,t} \\ & + \alpha_{12} NOL_{i,t} + \alpha_{13} \Delta NOL_{i,t} + \alpha_{14} MTB_{i,t-1} + \alpha_{15} LEV_{i,t} + \alpha_{16} FCF_{i,t} \\ & + \alpha_{17} R\&D_{i,t} + time\ and\ industry\ dummies + \varepsilon_{i,t} \end{aligned} \tag{2}$$

Equation (2) is adapted from Chen et al. (2010) and has been used extensively in related tax research (McGuire et al., 2012; Cheng et al., 2012). The idea behind Equation (2) is to use a wide range of controls to isolate the effect of our variable of interest, inside debt, on tax avoidance (*TAX*) while controlling for the indirect effects on tax avoidance through our controls.

[11] Frank et al. (2009) present *DTAX* as a measure of discretionary actions taken during the year that impact *ETR*, and they demonstrate that this measure is superior to other measures, such as *ETR*, in predicting actual tax sheltering. We follow their procedures (p. 473) and estimate *DTAX* as the residual from regressing permanent differences on intangibles, unconsolidated earnings, non-controlling interest in earnings, state tax expense, change in NOL, and lagged permanent differences. Each regression is estimated by two-digit SIC and fiscal year, requiring at least 15 non-missing observations in order to estimate *DTAX*.

TAX represents one of three measures of tax avoidance (*ETR*, *CETR*, or *DTAX*), and *Inside debt* represents one of three proxies for inside debt defined in Section 3.2. We report separate and combined regressions to estimate the effect of CEO and CFO inside debt on tax avoidance. In order to more accurately isolate the effect of inside debt on tax avoidance, we include both the executive's option *delta* and option *vega*, and the log of current compensation (salary and bonus), all measured at time *t-1*.[12] Similar to CHSS, we use time *t-1* compensation variables (*Inside debt*, *delta, vega*, and *Comp*) in our OLS estimation to control for the potential endogeneity that may exist between compensation and tax strategy.[13]

We include a wide range of controls in order to isolate the effect of our variable of interest on tax avoidance. Return on assets, *ROA*, is included to control for tax-related differences associated with profitability. *ROA* equals pretax book income divided by lagged total assets. Pretax discretionary accruals, *ACC*, are included to control for financial reporting aggressiveness (Frank et al., 2009).[14] Firm size, *SIZE*, is included to control for economies of scale associated with tax planning (Erickson et al., 1998). *SIZE* equals lagged market value of equity. Pretax foreign income, *FI*, is included to control for tax-related differences related to overseas operations (Rego, 2003). *FI* equals pretax foreign income divided by lagged total assets. Equity in earnings, *EQINC*, and intangibles, *INTAN*, are included to control for tax-related differences associated with earnings reported under the equity method and the use of intangibles (Chen et al., 2010). *EQINC* equals equity in earnings divided by lagged total assets (Compustat AT). *INTAN* equals intangible assets divided by lagged total assets. Property, plant, and equipment, *PPE*, is included

[12] We measure *delta* and *vega* using the Core and Guay (2002) "one year approximation" method. Theory and extant research in financial economics suggests higher *delta* (*vega*) results in less (greater) risk-taking (Coles et al., 2006; Brockman et al., 2010; Armstrong et al., 2013). Hence we believe it is important to include these two variables separately in the model. We find, however, that our results are robust to omitting and/or scaling *delta* and *vega*.

[13] In robustness tests, we present results from 2SLS estimation and propensity score matching.

[14] We follow Frank et al. (2009, p. 479) and estimate *ACC* as performance-matched pretax discretionary accruals.

to control for tax-related differences associated with capital intensity. *PPE* equals net property, plant, and equipment divided by lagged total assets.

We also control for the existence (*NOL*) and usage (*ΔNOL*) of net operating losses. *NOL* equals one if the firm reports a positive net operating loss during the year. *ΔNOL* equals the change in NOL divided by lagged total assets. Finally, we include the market-to-book ratio (*MTB*) to control for tax-related differences associated with growth opportunities, and *R&D* to control for tax savings from R&D activities. *MTB* equals lagged market value of equity divided by lagged book value of equity. *LEV* is computed as long-term debt divided by lagged total assets to control for the tax effects of corporate debt usage. *FCF* equals operating cash flow less capital expenditures divided by lagged total assets. *R&D* equals total research and development expense divided by lagged total assets. Fiscal year and industry (two-digit SIC) dummies are included, and standard errors are clustered by firm.[15]

4. Results and discussion

4.1. Descriptive statistics

Table 2 reports descriptive statistics for the variables used to estimate Equation (2). The average book effective tax rate (*ETR*) is 31.1 percent and the average cash effective tax rate (*CETR*) is 27.2 percent. Consistent with prior research (Dyreng et al., 2008) the book effective tax rate is larger than the cash effective tax rate. Average discretionary book-tax differences (*DTAX*) represent approximately 0.9% of lagged total assets. Overall, the means and medians of our tax avoidance variables (*ETR*, *CETR*, and *DTAX*) are very similar to related tax research (e.g., Frank et al., 2009; Chen et al., 2010; McGuire et al., 2012; Armstrong et al., 2012; Chyz et al., 2013).

[15] In untabulated tests, we confirm that our primary results are robust to clustering standard errors by firm and fiscal year.

---------- Insert Table 2 about here ----------

The average log of the CEO to firm debt/equity ratio (*CEO Debt*) is 0.581, which is larger than 0.401 reported in CHSS; however, our sample period is longer, we also estimate the CFO's inside debt (not just the CEO), and we place additional tax-related constraints on our sample which may account for the differences in means. Our dummy variable, *Hi CEO Debt,* is equal to one when the CEO's inside debt-to-equity ratio is greater than the firm's debt-to-equity ratio (*Hi CEO Debt*) has a mean of 0.285, similar to statistics reported in CHSS. The average compensation-related variables of the CFO are similar to the CEO, and the means and medians of our control variables are consistent with extant research (Chen et al., 2010; McGuire et al., 2012; Armstrong et al., 2012; Chyz et al., 2013).

4.2. OLS regression results

4.2.1. CEO inside debt

Table 3 reports results from estimating Equation (2) with the CEO's (but not CFO's) inside debt variables. Results suggest that neither the time *t-1* log of the CEO's inside debt to the firm's debt-to-equity ratio (*CEO Debt*) nor when this ratio exceeds one (*Hi CEO Debt*) is related to the firm's tax avoidance at time *t*. With the exception of Column (4), the coefficient estimates of our variables of interest are properly signed. However, in all but one column, the *p*-values (two-tailed) are all greater than 0.10.[16] Overall, these results suggest that the CEO's inside debt is not related to the firm's level of tax avoidance. We turn our attention in the next section to the CFO's inside debt as financial reporting choices, particularly related to tax strategy, are more likely to fall under the domain of the CFO.

---------- Insert Table 3 about here ----------

[16] The *p*-value of the *Hi CEO Debt* coefficient estimate in the *DTAX* regression (Column (6)) is 0.042.

4.2.2. CFO inside debt

Table 4 reports results from estimating Equation (2) with the CFO's (but not CEO's) inside debt variables. Results suggest, in all nine columns, that the CFO's inside debt is strongly associated with less tax avoidance.[17] For example, in Column (1), our coefficient estimate of 0.004 (*p*-value = 0.028) implies that, on average, a one-standard deviation increase in the CFO's inside debt ratio (*CFO Debt*) is associated with a 0.4% higher book effective tax rate (*ETR*) in the next year. This roughly translates into a $3.5 million greater income tax expense relative to other firms.[18] Examining the coefficient estimates in Columns (2) and (3) yield estimates of $6 million greater cash taxes paid and $25 million smaller book-tax differences, respectively.

---------- Insert Table 4 about here ----------

Examining Columns (4) through (6) reveal stronger results. Theoretically, the effect of inside debt should be more acute when the manager's inside debt-to-equity ratio exceeds the firm's debt-to-equity ratio (Jensen and Meckling, 1976). Not surprisingly, we find a much stronger effect. For example, in Column (5), we find that when the CFO's inside debt-to-equity ratio exceeds the firm's debt-to-equity ratio (*Hi CFO Debt*), cash effective tax rates (C*ETR*) are approximately 1.7 percent higher (Estimate = 0.017, *p*-value = 0.006) than other firms. This roughly translates into $15 million greater cash taxes paid relative to firms led by CFO's with inside debt-to-equity ratios that do not exceed the firm's debt-to-equity ratio. Similarly, Columns (4) and (6) suggest firms led by CFO's with inside debt-to-equity ratios that exceed the firm's debt-to-equity ratio report approximately $5 million greater income tax expense and $33 million smaller book-tax differences in the next year, respectively, relative to other firms. Finally,

[17] Higher (lower) effective tax rates (*DTAX*) reflects less tax avoidance. We note the coefficient estimate of *Hi CFO Debt* in the *ETR* regression (Column (4)) is only significant using a one-tailed test.

[18] The average pretax income (lagged total assets) in our sample is $862 million ($8,220 million).

Columns (7) through (9) corroborate these results and show a negative relation between CFOs' relative income ratio (*CFORelIncRatio*) and tax avoidance. Overall, we interpret these results as supporting our hypothesis that CFO inside debt is associated with a less aggressive tax strategy.[19]

4.2.3. CEO vs. CFO inside debt

Results in the previous section suggest that CFO inside debt is strongly related to a less aggressive corporate tax strategy. In this section, we estimate Equation (2) with both the CEO's and CFO's inside debt, and compensation-related variables, to confirm that the CFO's inside debt is the dominant force.[20] We present these results in Table 5. In every specification, results confirm that the CFO's inside debt has a strong negative relation to tax avoidance (i.e., higher book and cash effective tax rates and lower discretionary book-tax differences). For example, controlling for the CEO's inside debt and compensation-related variables, a one-standard deviation increase in the CFO's inside debt-to-equity ratio is associated with a 0.6% higher book effective tax rate (*ETR* regression, Column (1)), a 0.9% higher cash effective tax rate (C*ETR* regression, Column (2)), and 0.30% smaller book-tax differences (*DTAX* regression, Column (3)) in the next year. These estimates roughly translate into $5 million greater income tax expense, $8 million greater cash taxes paid, and $25 million smaller discretionary book-tax differences.

---------- Insert Table 5 about here ----------

Similarly, when the CFO's debt-to-equity ratio exceeds the firm's debt-to-equity ratio (Columns (4) through (6) in Table 5), the CFO's firm reports on average a 1.1% higher book

[19] We perform numerous robustness tests to confirm our result. First, our general inferences are not affected by our choice of including *delta* without *vega*, or vice versa, nor are they affected by scaling or omitting *delta* and *vega*. Our results also hold if we cluster standard errors by firm and fiscal year.

[20] A concern with estimating Equation (2) with the CEO's and CFO's inside debt is that the high correlation between CEO and CFO inside debt could induce multicollinearity. In diagnostic tests, we confirm our variance inflation factors for our variables of interest (*inside debt*) are 2 or less, and conclude that multicollinearity is not a significant concern in this specification.

effective tax rate (*ETR*), a 1.7 % higher cash effective tax rate (*CETR*), and 0.3% smaller book-tax differences (*DTAX*, though the coefficient estimate is only significant using a one-tailed test) in the next year relative to firms led by CFOs with inside debt-to-equity ratios that do not exceed the firm's debt-to-equity ratio. These differences roughly translate into $9.5 million greater income tax expense, $15 million greater cash taxes paid, and $26.5 million smaller book-tax differences, respectively. Columns (7) through (9) reveal similar results. Overall, we interpret these results as consistent with the hypothesis that CFO inside debt is associated with less tax avoidance.[21]

4.2.4. Distress risk as a potential moderating variable

In the previous section, we provide consistent evidence suggesting that inside debt held by the CFO is negatively related to tax avoidance. In this section, we investigate whether the relation between inside debt held by the CFO and tax avoidance is moderated by the firm's default (or distress) risk. Thus, we augment Equation (2) with a variable that captures a firm's distress risk (*Distress*). Following Anantharaman and Lee (2014), who find that inside debt held by the CFO mitigates aggressive pension choices such as underfunding and allocation to risky assets, we measure *Distress* as the "distance to default" from Campbell, Hilscher, and Szilagyi (2008) and multiply it by -1 so that it is increasing in default probability.[22] We then interact

[21] We perform numerous additional robustness tests to confirm the results reported in Tables 4 and 5. First, results are robust clustering standard errors by firm and fiscal year. Second, our results are robust to using the Fama and MacBeth (1973) two-step procedure in lieu of firm-level clustering. Third, our results are similar if we use Newey-West corrected standard errors up to four lags. Fourth, our results are generally unchanged if we use the Fama and French 49 industry classification in lieu of two-digit SIC. Fama and French industry definitions are found on Professor Ken French's faculty website at Dartmouth: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. Finally, To further control for the relative strength of equity-based incentives, we estimate Equation (2) with the ratio of *vega*-to-*delta*. Results are inferentially similar to Tables 4 and 5.

[22] We use the distance to default formula provided in the appendix of Campbell et al. (2008). Similar to Anantharaman and Lee (2014), we use the standard deviation of daily stock returns over the prior fiscal year in lieu of a rolling period, and, because one-year rates were eliminated between 2001 and 2008, we use the average of the six month and two year government note as the risk-free rate.

Distress with inside debt in order to examine whether the relation between inside debt and tax avoidance strengthens when the firm has a higher likelihood of distress.[23] Table 6 reports the results.

---------- Insert Table 6 about here ----------

Columns (1) through (3) provide consistent evidence that *CFO Debt* is positively related to book and cash effective tax rates and negatively related to discretionary book-tax differences, suggesting that the main effect of *CFO Debt* (in other words, when distress risk is empirically zero) is negatively related to tax avoidance. Interestingly, the interaction term (*CFO Debt*Distress*) is also positively related to tax avoidance, suggesting that distress risk has an incremental effect on the negative relation between *CFO Debt* and tax avoidance. Overall, we interpret these results as inside debt being more effective in mitigating tax avoidance when the firm's distress risk is higher.[24]

4.3. Robustness

4.3.1. Two-stage least squares

In our main analysis, we estimate OLS regressions of time *t* tax avoidance on time *t-1* inside debt and compensation-related variables in order to mitigate the potential concern of endogeneity. In this section, we repeat our main analysis using two-stage least squares. As noted in CHSS, there is scant empirical research examining the effects of inside debt on investment or financing policies, let alone financial reporting policies. Thus, we face a difficult task in finding

[23] We note that our sample by construction only includes firms with positive pretax income (in order to properly estimate a firm's effective tax rate and because loss firms are in an inherently different tax position than profitable firms). Hence, our sample selection biases against finding results and we interpret these results with caution.
[24] For brevity, we tabulate results for specifications in which *CFO Debt* is the independent variable of interest. In untabulated tests, we confirm results are similar if we use *CFORelIncRatio* as the independent variable of interest. Interestingly, we fail to find a significant moderating effect in the *Hi CFO Debt* specifications though the main effect of *Hi CFO Debt* is still significant. Further, our results on the interactions of *CFO Debt* or *CFORelIncRatio* and *Distress* hold if we include CEO inside debt variables.

valid instruments. CHSS uses the following instruments: CEO age, a dummy variable if the CEO is new to the firm, the natural log of total assets, firm age, a dummy variable if the firm reported negative operating cash flow, a dummy variable if the firm reports a net operating loss, the maximum state income tax rate where the firm is headquartered, and the industry median inside debt. However, because we are measuring the impact of the CFO's inside debt on tax strategy, most of these instruments are not appropriate for our setting. Thus, we estimate two-stage least squares with two instruments that we believe are more intuitive and hence should satisfy the necessary exclusion restrictions.

Our first instrument, *IndMedCFOInsideDebt*, is the industry median inside debt (pension plus deferred compensation) paid to CFOs in the same industry (two-digit SIC code). The logic behind this instrument is that CFO inside debt is partially determined by an industry's ability, and perhaps convention, to pay executives through pension and deferred compensation arrangements. Our second instrument, *GeoMedCFOInsideDebt*, is the median inside debt (pension plus deferred compensation) paid to other CFOs of firms in a different industry and located within 250 kilometers from the location of the firm's headquarters. Our reasoning for including this instrument is that it is quite likely that compensation paid to CFOs of other firms that are in close geographic proximity are visible to the CFO and, if higher, will likely influence the CFO to bid up his/her compensation so that it is consistent with other geographically proximate CFOs. Table 7 reports our results.

---------- Insert Table 8 about here ----------

Columns (1) through (3) report results from 2SLS estimation in which our endogenous variable is *CFO Debt*, and Columns (4) through (6) report results from 2SLS estimation in which our endogenous variable is *CFORelIncRatio*. In general, we find evidence corroborating our

OLS estimates, namely, that inside debt held by the CFO is positively related to book and cash effective tax rates and negatively related to discretionary book-tax differences. The results in the *DTAX* regressions (Columns (3) and (6)) are marginally significant using a one-tailed test; however, we note that the Hausman exogeneity test statistic is statistically insignificant, suggesting that OLS estimates in the *DTAX* regressions are consistent.[25] Overall, results from 2SLS provide further evidence that CFO inside debt in fiscal year *t-1* is negatively related to tax avoidance in fiscal year *t*.

4.3.3. Propensity score matching

Although our OLS regressions measure the effect of time *t-1* inside debt on time *t* tax avoidance to mitigate concerns of endogeneity, we report results using two-stage least squares in the previous section as a robustness test. In this section, we use propensity score matching to isolate the effect of our treatment variable (*Hi CFO Debt*) on tax avoidance. Accordingly, we match firms, with replacement, using compensation-related variables (*CFO Delta*, *CFO Vega*, *CFO Comp*), including the instruments used in 2SLS (*IndMedCFOInsideDebt*, *GeoMedCFOInsideDebt*), as our selection criteria. Firms are matched with the nearest neighbor using the Odds ratios from a first stage logistic regression.[26] Our selection procedure yields a

[25] For brevity, we only tabulate the second stage estimates and the instruments from the first stage. In all six regressions, the first stage instruments are statistically significant ($p = 0.000$). Because we have more instruments than endogenous regressors, we perform the Hansen *J*-test for overidentification and, with the exception of the *CETR* regressions (Columns (2) and (4)), the Hansen *J*-test statistics are insignificant. Hence, this test fails to reject the null hypothesis that our instruments are jointly valid. We also report the Hausman test for exogeneity and find this test statistic is statistically significant in all but the *DTAX* regressions, suggesting that *CFO Debt* and *CFORelIncRatio* is likely endogenous in the *ETR* and *CETR* regressions. In other words, coefficient estimates on *CFO Debt* and *CFORelIncRatio* using OLS are likely different than 2SLS estimates.

[26] The first stage logit model is: $Hi\ CFO\ Debt_{i,t-1} = \gamma_0 + \gamma_1 CFO\ Delta_{i,t-1} + \gamma_2 CFO\ Vega_{i,t-1} + \gamma_3 CFO\ Comp_{i,t-1} + \gamma_4 IndMedCFOInsideDebt_{i,t-1} + \gamma_5 GeoMedCFOInsideDebt_{i,t-1} + year\ and\ industry\ dummies$. To further aid in a proper matching, heteroskedasticity-consistent analytical standard errors are used for the compensation-related regressors following Abadie and Imbens (2006).

balanced sample of treatment (N = 727) and control firms (N = 727).[27] We then estimate Equation (2) using this matched sample of 1,454 firm-years. This method minimizes the possibility that compensation, in general, a primary driver of inside debt, may be influencing our results. Results are reported in Table 8.

---------- Insert Table 8 about here ----------

Columns (1) through (3) of Table 8 corroborate our results presented in Table 4, that firms led by CFOs with higher inside debt ratios than the firm's debt/equity ratio engage in less tax avoidance. Specifically, treatment firms (*Hi CFO Debt = 1*) have, on average, 1.3% higher book effective tax rates (p = 0.001), 3.8% higher cash effective tax rates (p = 0.019), and 0.5% smaller discretionary book-tax differences (p =0.118). These differences roughly translate into $12 million higher income tax expense, $34 million higher cash taxes paid, and $40 million smaller discretionary book-tax differences.[28] Overall, these results confirm the results using our pooled OLS sample in the previous section and support the hypothesis that inside debt diminishes CFOs' proclivity to engage in tax avoidance.

4.3.6. Factor analysis

In our primary analyses, we follow the convention in the literature by using multiple proxies of tax avoidance in order to triangulate our results and overcome the limitations of using just one proxy. In this section, we use principal components factor analysis to extract a common tax avoidance factor and use this as a measure of tax avoidance in Equation (2). Because the first eigenvalue is 0.72 and the remaining eigenvalues are less than 0.02, we retain the first factor.

[27] Untabulated tests show no differences in means between treatment (*Hi CFO Debt = 1*) and control (*Hi CFO Debt = 0*) firms across compensation-related variables after employing the matching procedure.
[28] The average pretax income (lagged total assets) in our matched sample (N = 1,454) is $889 million ($8,067 million).

The common tax avoidance factor is positively correlated with the effective tax rates (*ETR* and *CETR*) and negatively correlated with *DTAX*, suggesting that higher values of the tax avoidance factor imply less tax avoidance. In untabulated tests, we confirm our inferences from Tables 4 and 5 using the common tax avoidance factor in lieu of the individual tax avoidance proxies.

5. Conclusion

Avoiding corporate income taxes is an activity that can be risky for both shareholders and managers. Unfortunately, the literature provides little clarity about the relation between executive incentives and tax avoidance. Recent studies report that inside debt is positively associated with conservative investment activities and financing outcomes. Building on this literature, we investigate whether inside debt held by executives also moderates management's appetite for corporate tax avoidance. Using a large sample of firms across the past six years, we find a negative association between tax avoidance inside debt levels. We also build on research that finds that CFO incentives are more influential than CEO incentives in settings where financial expertise is required. Consistent with the observation that tax planning requires a high level of financial sophistication, we find that the association between tax avoidance and inside debt is more significant for the CFO than for the CEO.

Throughout our analyses we control for pre-existing tax avoidance opportunities and the debt-equity compensation of the executive. Recognizing that endogeneity is often an issue with studies of executive incentives, we employ multiple empirical strategies to address this potential concern. First, we control for other determinants of tax avoidance that can be correlated with the agency costs of debt and tax avoidance activities. These controls include proxies for the firm's historical investment and financing policies as well as future investment opportunities. Second, we endogenize our measures of inside debt via a two-stage least squares (2SLS) estimation in

order to address potential simultaneity between the level of inside debt and tax avoidance. Third, we implement the propensity score matching to estimate the sample average treatment effect on measures of tax avoidance where the treated firms are those for which the manager has an inside debt to equity ratio exceeding that of the firm. We find that our main results are robust to these alternative methods. Our work highlights the importance of increased focus on the CFOs incentives for investment and financing decisions, particularly when the decision involves sophisticated financial strategies such as those employed with tax avoidance.

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Appendix: Variable Definitions

Variable	Definition
A.1. Dependent Variables	
ETR_t	The annual book effective tax rate equals total tax expense (Compustat $TXT_{i,t}$) over pretax book income (Compustat $PI_{i,t}$).
$CETR_t$	The annual cash effective tax rate equals cash taxes paid (Compustat TXPD) over pretax book income (Compustat $PI_{i,t}$).
$DTAX_t$	Discretionary permanent book-tax differences is computed following Frank et al. (2009).
A.2. Independent Variables	
$Debt_{t-1}$	The inside debt of the CEO or CFO, computed following CHSS and is measured in the previous year where CEO Debt = (CEO IDH/CEO EH)/(FD/FE) and inside debt holdings (IDH) is computed as the sum of the present value of pension and deferred compensation; equity holdings (EH) equal the value of stock and options held by the executive; firm debt (FD) equals total debt (Compustat DLC + DLTT); and firm equity (FE) equals the market capitalization as of fiscal year end.
$Hi\ Debt_{t-1}$	An indicator variable equal to one if the CEO's (CFO's) inside debt to firm equity ratio is greater than one.
$CEO\ RelIncRatio_{t-1}$	The relative income ratio of the CEO (CFO), computed following Wei and Yermack (2011) and CHSS.
$Delta_{t-1}$	The natural logarithm of option delta computed following Core and Guay (2002).
$Vega_{t-1}$	The natural logarithm of option vega computed following Core and Guay (2002).
$Comp_{t-1}$	Current cash compensation (salary + bonus) paid to the CEO (CFO).
A.3. Instrumental Variables	
$IndMedCFOInsideDebt_{t-1}$	The median inside debt (pension plus deferred compensation) paid to CFOS in the same industry (two-digit SIC).
$GeoMedCFOInsideDebt_{t-1}$	The median inside debt (pension plus deferred compensation) paid to CFOs at firms located within 250 kilometers of the firm's headquarters and in different industries (two-digit SIC).
A.3. Control Variables	
ROA_t	Return on assets equals pretax book income (Compustat PIi,t) divided by lagged total assets (Compustat $AT_{i,t-1}$).
ACC_t	Performance-matched pretax discretionary accruals is computed following the procedures in Frank et al. (2009).
$SIZE_{t-1}$	Firm size is computed as the natural logarithm of lagged total market value of equity (Compustat $PRCC\_F_{i,t-1}$*$CSHO_{i,t-1}$).
FI_t	Foreign income is equals pretax income from foreign operations (Compustat $PIFO_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t-1}$).
$EQINC_t$	Equity in earnings (Compustat $ESUB_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t-1}$).
$INTAN_t$	Intangibles (Compustat $INTAN_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t-1}$).
PPE_t	Net property, plant and equipment (Compustat $PPENT_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t}$).
NOL_t	An indicator variable equal to one if the firm reports a positive tax loss carryforward during the year (Compustat $TLCF_{i,t}$).
ΔNOL_t	The change in firm i's NOL during the year scaled by lagged total assets (Compustat $AT_{i,t-1}$).
MTB_{t-1}	Market-to-book ratio equals the ratio of lagged market value of equity (Compustat $PRCC\_F_{i,t-1}$*$CSHO_{i,t-1}$) to lagged book value of equity (Compustat $CEQ_{i,t-1}$).

LEV_{t-1}	Long-term debt (Compustat DLTTi,t) divided by lagged total assets (Compustat $AT_{i,t-1}$).
FCF_t	Free cash flow equals operating cash flow minus capital expenditures (Compustat $OANCF_{i,t}$ - $CAPX_{i,t}$) scaled by lagged total assets (Compustat $AT_{i,t-1}$).
$R\&D_t$	Research and development activity equals R&D expense (Compustat $XRD_{i,t}$) by lagged total assets (Compustat $AT_{i,t-1}$).

Table 1

Sample composition.

This table reports the sample distribution by fiscal year (Panel A) and industry (Panel B).

Panel A: Time distribution.

Fiscal year	Frequency	%	Cumulative Freq.	Cumulative %
2007	754	15.92	754	15.92
2008	751	15.86	1,505	31.78
2009	757	15.99	2,262	47.77
2010	855	18.06	3,117	65.83
2011	826	17.44	3,943	83.27
2012	792	16.73	4,735	100.00

Panel B: Industry distribution.

Industry (1-digit SIC)	Frequency	%	Cumulative Freq	Cumulative %
0-1 (Agriculture, mining, oil and construction)	304	6.42%	304	6.42%
2 (Food, tobacco, textiles, paper and chemicals)	1,035	21.86%	1,339	28.28%
3 (Manufacturing, machinery and electronics)	1,533	32.38%	2,872	60.65%
4 (Transportation and communications)	279	5.89%	3,151	66.55%
5 (Wholesale and retail)	726	15.33%	4,456	94.11%
7 (Services)	579	12.23%	4,456	94.11%
8-9 (Health, legal and educational services and other)	279	5.89%	4,735	100.00%

Table 2

Descriptive statistics.

This table reports summary statistics for the variables used in our primary analyses. The sample is comprised of 4,735 observations spanning fiscal years 2007 through 2012. The annual book effective tax rate, *ETR*, equals total tax expense (Compustat $TXT_{i,t}$) over pretax book income (Compustat $PI_{i,t}$). The annual cash effective tax rate, *CETR*, equals cash taxes paid (Compustat $TXPD_{i,t}$) over pretax book income (Compustat $PI_{i,t}$). Discretionary permanent book-tax differences, *DTAX*, is computed following Frank et al. (2009). *Inside debt* is the natural logarithm of the inside debt ratio of the CEO or CFO measured in the previous year, and is computed following CHSS. *Hi CEO (CFO) Debt* is a dummy variable equal to one if the CEO (CFO) inside debt to firm equity ratio is greater than one. *RelIncRatio* is the natural logarithm of the relative incentive ratio of the CEO or CFO measured in the previous year, and is computed following CHSS. *Delta(Vega)* equals the executive's option Delta (Vega) measured in the prior year. Option deltas and vegas are computed using the "one-year approximation" method of Core and Guay (2002). *Comp* is the natural logarithm of the CEO's or CFO's current compensation (salary + bonus) measured in the previous fiscal year. Return on assets, *ROA*, equals pretax book income (Compustat $PI_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t-1}$). Performance-matched pretax discretionary accruals, *ACC*, is computed following Frank et al. (2009). Firm size, *SIZE*, is computed as the natural logarithm of lagged total market value of equity (Compustat $PRCC\_F_{i,t-1}$*$CSHO_{i,t-1}$). Foreign income, *FI*, is equals pretax income from foreign operations (Compustat $PIFO_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t-1}$). *EQINC* equals as equity in earnings (Compustat $ESUB_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t-1}$). *INTAN* equals reported intangibles (Compustat $INTAN_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t-1}$). *PPE* is equals net property, plant and equipment (Compustat $PPENT_{i,t}$) divided by lagged total assets (Compustat $AT_{i,t}$). *NOL* is an indicator variable equal to one if the firm reports a positive tax loss carryforward during the year (Compustat $TLCF_{i,t}$). *ΔNOL* equals the change in firm *i*'s *NOL* during the year scaled by lagged total assets (Compustat $AT_{i,t-1}$). Market-to-book ratio, *MTB*, equals the ratio of lagged market value of equity (Compustat $PRCC\_F_{i,t-1}$*$CSHO_{i,t-1}$) to lagged book value of equity (Compustat $CEQ_{i,t-1}$). Leverage, LEV, equals long-term debt divided by lagged total assets (Compustat $DLTT_{i,t}/AT_{i,t-1}$). Free cash flow, *FCF*, equals operating cash flow minus capital expenditures (Compustat $OANCF_{i,t}$ - $CAPX_{i,t}$) scaled by lagged total assets (Compustat $ATi,_{t-1}$). Research and development activity, *R&D*, equals R&D expense (Compustat $XRD_{i,t}$) scaled by lagged total assets (Compustat $AT_{i,t-1}$). Effective tax rates (*ETR*, *CETR*) are constrained to lie on the [0,1] interval to ensure a valid economic interpretation. Utilities and financial firms are excluded from the sample. All continuous tax and control variables are winsorized at the 1% and 99% level to mitigate the influence of outliers.

Variable	N	Mean	Std dev	10th Pctl	50th Pctl	90th Pctl
ETR_t	4,735	0.311	0.148	0.120	0.329	0.408
$CETR_t$	4,735	0.272	0.200	0.036	0.256	0.469
$DTAX_t$	4,735	0.009	0.076	-0.058	0.002	0.077
$CEO\ Debt_{t-1}$	4,735	0.581	0.892	0.000	0.191	1.699
$Hi\ CEO\ Debt_{t-1}$	4,735	0.285	0.452	0.000	0.000	1.000
$CEORelIncRatio_{t-1}$	4,735	0.518	0.838	0.000	0.160	1.493
$CEO\ delta_{t-1}$	4,735	5.620	1.465	3.800	5.637	7.423
$CEO\ vega_{t-1}$	4,735	3.869	2.077	0.000	4.272	6.258
$CEO\ Comp_{t-1}$	4,735	6.761	0.580	6.146	6.752	7.409
$CFO\ Debt_{t-1}$	4,735	0.646	1.005	0.000	0.193	1.945
$Hi\ CFO\ Debt_{t-1}$	4,735	0.303	0.460	0.000	0.000	1.000
$CFORelIncRatio_{t-1}$	4,735	0.578	0.951	0.000	0.157	1.715
$CFO\ delta_{t-1}$	4,735	3.894	1.406	1.991	3.961	5.656
$CFO\ vega_{t-1}$	4,735	2.777	1.712	0.000	2.962	4.905
$CFO\ Comp_{t-1}$	4,735	6.105	0.503	5.542	6.054	6.738
ROA_t	4,735	0.114	0.081	0.029	0.099	0.215
ACC_t	4,735	-0.007	0.051	-0.066	-0.003	0.049
$SIZE_{t-1}$	4,735	7.852	1.517	6.074	7.691	9.933
FI_t	4,735	0.032	0.045	0.000	0.013	0.094
$EQINC_t$	4,735	0.001	0.004	0.000	0.000	0.003
$INTAN_t$	4,735	0.269	0.241	0.006	0.216	0.604
PPE_t	4,735	0.284	0.249	0.053	0.197	0.675
NOL_t	4,735	0.544	0.498	0.000	1.000	1.000
ΔNOL_t	4,735	0.003	0.044	-0.016	0.000	0.022
MTB_{t-1}	4,735	3.260	3.508	1.137	2.343	5.587
LEV_t	4,735	0.244	0.184	0.014	0.220	0.485
FCF_t	4,735	0.076	0.078	-0.008	0.074	0.165
$R\&D_t$	4,735	0.025	0.041	0.000	0.002	0.085

Table 3

CEOs: The association between CEO inside debt and tax avoidance.

This table reports results from OLS regressions in which *ETR*, *CETR*, and *DTAX* are the dependent variables. For brevity, time and industry dummies are not tabulated. Standard errors are corrected for heteroskedasticity and clustered by firm. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

	(1) ETR_t		*(2) $CETR_t$*		*(3) $DTAX_t$*		*(4) ETR_t*		*(5) $CETR_t$*		*(6) $DTAX_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.297	0.000	0.408	0.000	0.062	0.107	0.296	0.000	0.409	0.000	0.061	0.107
CEO $Debt_{t-1}$	***0.002***	***0.499***	***0.003***	***0.309***	***-0.002***	***0.290***						
Hi CEO $Debt_{t-1}$							***-0.003***	***0.485***	***0.010***	***0.132***	***-0.005***	***0.042***
CEO $delta_{t-1}$	0.007	0.001	0.004	0.092	-0.005	0.000	0.006	0.003	0.005	0.070	-0.005	0.000
CEO $vega_{t-1}$	0.001	0.396	0.004	0.007	0.001	0.118	0.001	0.355	0.004	0.008	0.001	0.105
CEO $Comp_{t-1}$	0.006	0.210	0.005	0.408	-0.003	0.258	0.006	0.183	0.005	0.417	-0.003	0.264
ROA_t	0.136	0.001	-0.067	0.260	-0.068	0.007	0.137	0.001	-0.066	0.262	-0.069	0.007
ACC_t	-0.230	0.000	-0.863	0.000	0.079	0.021	-0.227	0.000	-0.866	0.000	0.080	0.019
$SIZE_{t-1}$	-0.009	0.000	-0.007	0.010	-0.001	0.514	-0.008	0.000	-0.008	0.007	-0.001	0.617
FI_t	-0.576	0.000	-0.092	0.193	0.271	0.000	-0.573	0.000	-0.093	0.186	0.272	0.000
$EQINC_t$	-1.194	0.033	-0.182	0.814	-0.641	0.082	-1.144	0.042	-0.228	0.769	-0.617	0.093
$INTAN_t$	0.012	0.329	0.007	0.685	0.025	0.002	0.012	0.337	0.007	0.685	0.025	0.002
PPE_t	0.011	0.450	-0.102	0.000	-0.003	0.744	0.011	0.433	-0.102	0.000	-0.003	0.739
NOL_t	-0.009	0.030	-0.025	0.000	0.002	0.425	-0.009	0.028	-0.025	0.000	0.002	0.430
ΔNOL_t	0.077	0.290	0.277	0.001	0.113	0.019	0.079	0.275	0.276	0.001	0.113	0.019
MTB_{t-1}	0.000	0.755	0.002	0.166	0.001	0.095	0.000	0.774	0.002	0.168	0.001	0.093
LEV_t	-0.031	0.054	-0.063	0.004	0.006	0.514	-0.034	0.036	-0.062	0.004	0.006	0.533
FCF_t	-0.113	0.023	-0.541	0.000	0.038	0.193	-0.111	0.026	-0.542	0.000	0.038	0.185
$R\&D_t$	-0.459	0.000	-0.537	0.000	0.227	0.000	-0.465	0.000	-0.532	0.000	0.225	0.000
R^2	0.15		0.13		0.10		0.15		0.13		0.10	
N	4,735		4,735		4,735		4,735		4,735		4,735	

Table 3, continued

CEOs: The association between CEO inside debt and tax avoidance.

This table reports results from OLS regressions in which *ETR*, *CETR*, and *DTAX* are the dependent variables. For brevity, time and industry dummies are not tabulated. Standard errors are corrected for heteroskedasticity and clustered by firm. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

	(7) ETR_t		*(8) $CETR_t$*		*(9) $DTAX_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.297	0.000	0.408	0.000	0.062	0.105
$CEORelIncRatio_{t-1}$	***0.002***	***0.450***	***0.003***	***0.334***	***-0.002***	***0.295***
CEO $delta_{t-1}$	0.007	0.001	0.004	0.096	-0.005	0.000
CEO $vega_{t-1}$	0.001	0.382	0.004	0.006	0.001	0.130
CEO $Comp_{t-1}$	0.006	0.213	0.005	0.407	-0.003	0.259
ROA_t	0.135	0.001	-0.067	0.261	-0.068	0.007
ACC_t	-0.230	0.000	-0.863	0.000	0.079	0.021
$SIZE_{t-1}$	-0.009	0.000	-0.007	0.010	-0.001	0.496
FI_t	-0.577	0.000	-0.092	0.194	0.271	0.000
$EQINC_t$	-1.195	0.033	-0.177	0.820	-0.642	0.081
$INTAN_t$	0.012	0.329	0.007	0.686	0.025	0.002
PPE_t	0.011	0.451	-0.102	0.000	-0.003	0.744
NOL_t	-0.009	0.030	-0.025	0.000	0.002	0.423
ΔNOL_t	0.076	0.291	0.277	0.001	0.113	0.019
MTB_{t-1}	0.000	0.755	0.002	0.165	0.001	0.095
LEV_t	-0.031	0.056	-0.063	0.004	0.006	0.515
FCF_t	-0.113	0.023	-0.541	0.000	0.038	0.192
$R\&D_t$	-0.459	0.000	-0.538	0.000	0.228	0.000
R^2	0.15		0.13		0.10	
N	4,735		4,735		4,735	

Table 4

CFOs: The association between CFO inside debt and tax avoidance.

This table reports results from OLS regressions in which *ETR*, *CETR*, and *DTAX* are the dependent variables. For brevity, time and industry dummies are not tabulated. Standard errors are corrected for heteroskedasticity and clustered by firm. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

	(1) ETR_t		*(2) $CETR_t$*		*(3) $DTAX_t$*		*(4) ETR_t*		*(5) $CETR_t$*		*(6) $DTAX_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.340	0.000	0.465	0.000	0.041	0.280	0.339	0.000	0.466	0.000	0.041	0.276
CFO $Debt_{t-1}$	***0.004***	***0.028***	***0.007***	***0.013***	***-0.003***	***0.026***						
Hi CFO $Debt_{t-1}$							***0.006***	***0.164***	***0.017***	***0.006***	***-0.004***	***0.066***
CFO $delta_{t-1}$	0.009	0.000	0.001	0.692	-0.005	0.002	0.008	0.000	0.001	0.684	-0.005	0.002
CFO $vega_{t-1}$	-0.002	0.274	0.006	0.011	0.002	0.111	-0.002	0.263	0.006	0.014	0.002	0.103
CFO $Comp_{t-1}$	-0.001	0.882	-0.004	0.606	0.000	0.904	-0.001	0.921	-0.004	0.618	-0.001	0.867
ROA_t	0.132	0.002	-0.069	0.245	-0.071	0.006	0.135	0.002	-0.066	0.269	-0.072	0.005
ACC_t	-0.235	0.000	-0.866	0.000	0.083	0.015	-0.235	0.000	-0.873	0.000	0.084	0.015
$SIZE_{t-1}$	-0.007	0.002	-0.005	0.055	-0.001	0.200	-0.007	0.002	-0.006	0.041	-0.002	0.191
FI_t	-0.579	0.000	-0.103	0.147	0.269	0.000	-0.577	0.000	-0.108	0.130	0.269	0.000
$EQINC_t$	-1.215	0.031	-0.170	0.826	-0.621	0.092	-1.194	0.034	-0.189	0.807	-0.629	0.088
$INTAN_t$	0.011	0.388	0.007	0.661	0.027	0.001	0.011	0.391	0.008	0.636	0.027	0.001
PPE_t	0.006	0.664	-0.108	0.000	-0.002	0.850	0.007	0.645	-0.108	0.000	-0.002	0.836
NOL_t	-0.009	0.037	-0.025	0.000	0.002	0.435	-0.009	0.038	-0.025	0.000	0.002	0.441
ΔNOL_t	0.077	0.287	0.277	0.001	0.111	0.022	0.078	0.282	0.277	0.001	0.111	0.022
MTB_{t-1}	0.000	0.675	0.002	0.165	0.001	0.086	0.000	0.678	0.002	0.166	0.001	0.086
LEV_t	-0.027	0.088	-0.056	0.009	0.005	0.576	-0.030	0.062	-0.057	0.007	0.007	0.497
FCF_t	-0.119	0.016	-0.548	0.000	0.042	0.146	-0.119	0.016	-0.551	0.000	0.042	0.143
$R\&D_t$	-0.449	0.000	-0.531	0.000	0.224	0.000	-0.453	0.000	-0.527	0.000	0.226	0.000
R^2	0.14		0.13		0.10		0.14		0.13		0.10	
N	4,735		4,735		4,735		4,735		4,735		4,735	

Table 4, continued

CFOs: The association between CFO inside debt and tax avoidance.

This table reports results from OLS regressions in which *ETR*, *CETR*, and *DTAX* are the dependent variables. For brevity, time and industry dummies are not tabulated. Standard errors are corrected for heteroskedasticity and clustered by firm. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

	(7) ETR_t		*(8) $CETR_t$*		*(9) $DTAX_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.340	0.000	0.464	0.000	0.041	0.276
$CFORelIncRatio_{t-1}$	***0.004***	***0.038***	***0.007***	***0.019***	***-0.003***	***0.029***
CFO $delta_{t-1}$	0.009	0.000	0.001	0.735	-0.005	0.002
CFO $vega_{t-1}$	-0.002	0.312	0.006	0.009	0.002	0.133
CFO $Comp_{t-1}$	-0.001	0.884	-0.004	0.609	0.000	0.904
ROA_t	0.132	0.002	-0.069	0.246	-0.071	0.006
ACC_t	-0.234	0.000	-0.866	0.000	0.083	0.016
$SIZE_{t-1}$	-0.007	0.002	-0.005	0.061	-0.002	0.185
FI_t	-0.578	0.000	-0.102	0.152	0.269	0.000
$EQINC_t$	-1.211	0.031	-0.161	0.835	-0.623	0.091
$INTAN_t$	0.011	0.389	0.007	0.662	0.027	0.001
PPE_t	0.006	0.660	-0.107	0.000	-0.002	0.847
NOL_t	-0.009	0.037	-0.025	0.000	0.002	0.435
ΔNOL_t	0.077	0.286	0.278	0.001	0.111	0.022
MTB_{t-1}	0.000	0.677	0.002	0.164	0.001	0.086
LEV_t	-0.028	0.086	-0.057	0.008	0.006	0.573
FCF_t	-0.119	0.016	-0.547	0.000	0.042	0.147
$R\&D_t$	-0.450	0.000	-0.533	0.000	0.225	0.000
R^2	0.14		0.13		0.10	
N	4,735		4,735		4,735	

Table 5

CEOs vs. CFOs: The association between CEO and CFO inside debt and tax avoidance.

This table reports results from OLS regressions in which *ETR*, *CETR*, and *DTAX* are the dependent variables. For brevity, time and industry dummies are not tabulated. Standard errors are corrected for heteroskedasticity and clustered by firm. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

	(1) ETR_t		*(2) $CETR_t$*		*(3) $DTAX_t$*		*(4) ETR_t*		*(5) $CETR_t$*		*(6) $DTAX_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.312	0.000	0.435	0.000	0.054	0.168	0.309	0.000	0.435	0.000	0.054	0.164
CEO $Debt_{t-1}$	***-0.003***	***0.336***	***-0.003***	***0.471***	***0.001***	***0.786***						
Hi CEO $Debt_{t-1}$							***-0.009***	***0.111***	***0.002***	***0.827***	***-0.004***	***0.207***
CEO $delta_{t-1}$	0.004	0.050	0.004	0.205	-0.004	0.001	0.004	0.053	0.004	0.108	-0.004	0.000
CEO $vega_{t-1}$	0.002	0.212	0.002	0.317	0.001	0.268	0.002	0.211	0.002	0.379	0.001	0.218
CEO $Comp_{t-1}$	0.007	0.192	0.009	0.230	-0.004	0.231	0.008	0.174	0.008	0.231	-0.004	0.244
CFO $Debt_{t-1}$	***0.006***	***0.026***	***0.009***	***0.025***	***-0.003***	***0.037***						
Hi CFO $Debt_{t-1}$							***0.011***	***0.035***	***0.017***	***0.019***	***-0.003***	***0.207***
CFO $delta_{t-1}$	0.008	0.002	0.001	0.754	-0.003	0.038	0.008	0.002	0.001	0.816	-0.003	0.050
CFO $vega_{t-1}$	-0.004	0.087	0.004	0.222	0.001	0.552	-0.004	0.083	0.004	0.220	0.001	0.571
CFO $Comp_{t-1}$	-0.004	0.609	-0.008	0.390	0.002	0.599	-0.004	0.632	-0.008	0.397	0.002	0.628
ROA_t	0.128	0.003	-0.072	0.229	-0.065	0.011	0.131	0.002	-0.070	0.242	-0.066	0.010
ACC_t	-0.232	0.000	-0.865	0.000	0.080	0.020	-0.233	0.000	-0.873	0.000	0.082	0.017
$SIZE_{t-1}$	-0.010	0.000	-0.008	0.007	0.000	0.889	-0.010	0.000	-0.009	0.004	0.000	0.988
FI_t	-0.574	0.000	-0.100	0.160	0.271	0.000	-0.573	0.000	-0.106	0.136	0.271	0.000
$EQINC_t$	-1.215	0.030	-0.167	0.829	-0.637	0.085	-1.162	0.038	-0.213	0.783	-0.620	0.092
$INTAN_t$	0.010	0.413	0.007	0.692	0.026	0.002	0.010	0.407	0.007	0.666	0.026	0.002
PPE_t	0.009	0.534	-0.105	0.000	-0.002	0.823	0.009	0.523	-0.105	0.000	-0.002	0.815
NOL_t	-0.009	0.030	-0.025	0.000	0.002	0.425	-0.009	0.031	-0.025	0.000	0.002	0.445
ΔNOL_t	0.076	0.296	0.277	0.001	0.113	0.019	0.077	0.288	0.274	0.001	0.114	0.018
MTB_{t-1}	0.000	0.614	0.001	0.178	0.001	0.073	0.000	0.624	0.001	0.184	0.001	0.071
LEV_t	-0.029	0.076	-0.058	0.007	0.005	0.613	-0.032	0.050	-0.058	0.007	0.005	0.594
FCF_t	-0.111	0.025	-0.540	0.000	0.037	0.203	-0.111	0.026	-0.545	0.000	0.038	0.189
$R\&D_t$	-0.448	0.000	-0.529	0.000	0.223	0.000	-0.454	0.000	-0.523	0.000	0.222	0.000
R^2	0.15		0.14		0.10		0.15		0.14		0.10	
N	4,735		4,735		4,735		4,735		4,735		4,735	

Table 5, continued

CEOs vs. CFOs: The association between CEO and CFO inside debt and tax avoidance.

This table reports results from OLS regressions in which *ETR*, *CETR*, and *DTAX* are the dependent variables. For brevity, time and industry dummies are not tabulated. Standard errors are corrected for heteroskedasticity and clustered by firm. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

	(7) ETR_t		*(8) $CETR_t$*		*(9) $DTAX_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.311	0.000	0.434	0.000	0.054	0.165
$CEORelIncRatio_{t-1}$	***-0.003***	***0.427***	***-0.003***	***0.526***	***0.000***	***0.828***
CEO $delta_{t-1}$	0.004	0.045	0.004	0.199	-0.004	0.001
CEO $vega_{t-1}$	0.002	0.220	0.002	0.324	0.001	0.265
CEO $Comp_{t-1}$	0.007	0.198	0.008	0.235	-0.004	0.235
$CFORelIncRatio_{t-1}$	***0.006***	***0.043***	***0.008***	***0.038***	***-0.003***	***0.046***
CFO $delta_{t-1}$	0.008	0.002	0.001	0.797	-0.003	0.041
CFO $vega_{t-1}$	-0.004	0.100	0.004	0.194	0.001	0.602
CFO $Comp_{t-1}$	-0.004	0.616	-0.008	0.396	0.002	0.603
ROA_t	0.128	0.003	-0.071	0.231	-0.065	0.011
ACC_t	-0.232	0.000	-0.865	0.000	0.080	0.020
$SIZE_{t-1}$	-0.010	0.000	-0.008	0.008	0.000	0.859
FI_t	-0.573	0.000	-0.098	0.166	0.270	0.000
$EQINC_t$	-1.215	0.030	-0.162	0.833	-0.638	0.084
$INTAN_t$	0.010	0.414	0.007	0.694	0.026	0.002
PPE_t	0.009	0.530	-0.105	0.000	-0.002	0.820
NOL_t	-0.009	0.031	-0.025	0.000	0.002	0.427
ΔNOL_t	0.076	0.295	0.277	0.001	0.113	0.019
MTB_{t-1}	0.000	0.613	0.001	0.178	0.001	0.073
LEV_t	-0.029	0.075	-0.058	0.007	0.005	0.609
FCF_t	-0.111	0.025	-0.540	0.000	0.037	0.203
$R\&D_t$	-0.449	0.000	-0.530	0.000	0.223	0.000
R^2	0.15		0.14		0.10	
N	4,735		4,735		4,735	

Table 6

CFOs: The association between CFO inside debt and tax avoidance interacted with distress.

This table reports results from OLS regressions in which *ETR*, *CETR*, and *DTAX* are the dependent variables. *Distress* is computed as the distance to default, multiplied by -1, following Campbell, Hilscher, and Szilagyi (2008). All other variables are defined previously. For brevity, time and industry dummies are not tabulated. Standard errors are corrected for heteroskedasticity and clustered by firm. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

	(1) ETR_t		*(2) $CETR_t$*		*(3) $DTAX_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.338	0.000	0.463	0.000	0.040	0.288
CFO $Debt_{t-1}$	***0.006***	***0.037***	***0.011***	***0.005***	***-0.004***	***0.006***
$Distress_{t-1}$	***-0.006***	***0.004***	***-0.010***	***0.002***	***0.002***	***0.288***
*CFO $Debt_{t-1}$*$Distress_{t-1}$*	***0.002***	***0.160***	***0.004***	***0.040***	***-0.001***	***0.063***
CFO $delta_{t-1}$	0.008	0.001	0.000	0.884	-0.004	0.003
CFO $vega_{t-1}$	-0.002	0.272	0.007	0.008	0.001	0.165
CFO $Comp_{t-1}$	-0.001	0.897	-0.004	0.567	0.000	0.959
ROA_t	0.134	0.002	-0.070	0.243	-0.072	0.005
ACC_t	-0.233	0.000	-0.864	0.000	0.085	0.014
$SIZE_{t-1}$	-0.008	0.000	-0.007	0.013	-0.001	0.241
FI_t	-0.576	0.000	-0.093	0.192	0.269	0.000
$EQINC_t$	-1.300	0.021	-0.204	0.794	-0.572	0.118
$INTAN_t$	0.009	0.458	0.006	0.721	0.026	0.001
PPE_t	0.007	0.647	-0.107	0.000	-0.002	0.864
NOL_t	-0.009	0.039	-0.025	0.000	0.002	0.412
ΔNOL_t	0.066	0.364	0.265	0.002	0.112	0.020
MTB_{t-1}	0.000	0.623	0.001	0.191	0.001	0.077
LEV_t	-0.023	0.164	-0.048	0.026	0.004	0.680
FCF_t	-0.123	0.013	-0.555	0.000	0.042	0.149
$R\&D_t$	-0.448	0.000	-0.525	0.000	0.224	0.000
R^2	0.15		0.14		0.10	
N	4,726		4,726		4,726	

Table 7

CFOs: The association between CFO inside debt and tax avoidance, 2SLS.

This table reports results from two-stage least squares estimation in which *ETR*, *CETR*, and *DTAX* are the dependent variables of interest and CFO inside debt (*CFO Debt$_{t-1}$*, *CFORelIncRatio$_{t-1}$*) is the endogenous variable. For brevity, only the second stage results and instruments from the first stage are reported. Test statistics and *p*-values from Hansen's *J*-Test for over-identifying restrictions and Hausman's exogeneity test are reported at the bottom of the table. For brevity, time and industry dummies are not tabulated. Robust standard errors are used to determine significance. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

Second stage results:	*(1) ETR$_t$*		*(2) CETR$_t$*		*(3) DTAX$_t$*		*(4) ETR$_t$*		*(5) CETR$_t$*		*(6) DTAX$_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.392	0.000	0.539	0.000	0.028	0.442	0.387	0.000	0.529	0.000	0.030	0.413
Pr(CFO Debt$_{t-1}$)	***0.054***	***0.011***	***0.076***	***0.012***	***-0.014***	***0.205***						
Pr(CFO RelIncRatio$_{t-1}$)							***0.057***	***0.012***	***0.080***	***0.016***	***-0.015***	***0.216***
CFO delta$_{t-1}$	0.015	0.000	0.010	0.061	-0.006	0.003	0.014	0.000	0.008	0.095	-0.006	0.002
CFO vega$_{t-1}$	-0.002	0.216	0.006	0.025	0.002	0.092	0.000	0.867	0.009	0.002	0.001	0.263
CFO Comp$_{t-1}$	-0.008	0.299	-0.013	0.141	0.001	0.735	-0.008	0.286	-0.013	0.139	0.001	0.725
ROA$_t$	0.102	0.027	-0.113	0.077	-0.063	0.015	0.100	0.029	-0.114	0.076	-0.063	0.016
ACC$_t$	-0.284	0.000	-0.935	0.000	0.095	0.007	-0.283	0.000	-0.933	0.000	0.094	0.007
SIZE$_{t-1}$	-0.015	0.000	-0.016	0.004	0.000	0.877	-0.014	0.000	-0.015	0.005	0.000	0.953
FI$_t$	-0.663	0.000	-0.222	0.015	0.289	0.000	-0.657	0.000	-0.211	0.018	0.287	0.000
EQINC$_t$	-1.950	0.004	-1.210	0.188	-0.448	0.262	-1.937	0.004	-1.171	0.203	-0.453	0.256
INTAN$_t$	0.018	0.180	0.017	0.336	0.025	0.003	0.018	0.175	0.017	0.333	0.025	0.003
PPE$_t$	-0.005	0.767	-0.123	0.000	0.001	0.926	-0.004	0.782	-0.122	0.000	0.001	0.935
NOL$_t$	-0.008	0.080	-0.023	0.000	0.001	0.507	-0.008	0.083	-0.023	0.000	0.001	0.512
ΔNOL$_t$	0.049	0.499	0.238	0.005	0.118	0.013	0.051	0.482	0.242	0.004	0.117	0.014
MTB$_{t-1}$	0.000	0.524	0.001	0.227	0.001	0.068	0.000	0.536	0.001	0.220	0.001	0.069
LEV$_t$	0.027	0.343	0.021	0.601	-0.007	0.630	0.028	0.334	0.021	0.609	-0.007	0.630
FCF$_t$	-0.144	0.005	-0.583	0.000	0.048	0.091	-0.144	0.005	-0.582	0.000	0.048	0.092
R&D$_t$	-0.313	0.002	-0.339	0.006	0.192	0.001	-0.318	0.001	-0.350	0.004	0.194	0.001
First stage instruments:												
IndMedCFOInsideDebt$_{t-1}$	0.082	0.000	0.082	0.000	0.082	0.000	0.078	0.000	0.078	0.000	0.078	0.000
GeoMedCFOInsideDebt$_{t-1}$	0.031	0.000	0.031	0.000	0.031	0.000	0.027	0.000	0.027	0.000	0.027	0.000
Hansen *J*-Test	0.65	0.42	3.51	0.06	0.57	0.45	0.83	0.36	3.96	0.05	0.66	0.42
Hausman Exogeneity Test	5.97	0.01	5.92	0.02	1.10	0.29	5.85	0.02	5.56	0.02	1.06	0.30
R^2	0.05		0.03		0.08		0.05		0.03		0.08	
N	4,735		4,735		4,735		4,735		4,735		4,735	

Table 8

CFOs: The association between CFO inside debt and tax avoidance, propensity score matching.

This table reports results from OLS regressions in which *ETR*, *CETR*, and *DTAX* are the dependent variables and *Hi CFO Debt* is the independent variable of interest. Treatment firms (*Hi CFO Debt* = 1) are matched, with replacement, to control firms (*Hi CFO Debt* = 0) that have the closest propensity score. The selection criteria in the first stage are comprised of compensation-related variables (*CFO Delta*, *CFO Vega*, *CFO Comp*), including instruments from Table 7 (*IndMedCFOInsideDebt*, *GeoMedCFOInsideDebt*), and year and industry dummies. For brevity, the first stage estimates, and time and industry dummies are not tabulated. Standard errors are clustered by firm and fiscal year. Our variables of interest are **bolded** and *italicized*. All *p*-values are two-tailed.

	(1) ETR_t		*(2) $CETR_t$*		*(3) $DTAX_t$*	
Variable	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Intercept	0.289	0.000	0.486	0.000	0.065	0.147
Hi CFO Debt$_{t-1}$	***0.013***	***0.001***	***0.038***	***0.019***	***-0.005***	***0.118***
CFO delta$_{t-1}$	0.011	0.033	-0.001	0.850	-0.006	0.031
CFO vega$_{t-1}$	-0.003	0.402	0.011	0.002	0.001	0.382
CFO Comp$_{t-1}$	0.002	0.768	0.006	0.398	-0.003	0.691
ROA$_t$	0.156	0.021	-0.024	0.843	-0.040	0.606
ACC$_t$	-0.364	0.006	-1.030	0.000	0.135	0.133
SIZE$_{t-1}$	-0.005	0.062	-0.009	0.141	-0.001	0.686
FI$_t$	-0.667	0.000	-0.272	0.002	0.338	0.000
EQINC$_t$	0.172	0.826	-0.290	0.648	0.748	0.028
INTAN$_t$	0.034	0.142	-0.007	0.834	0.025	0.014
PPE$_t$	0.027	0.416	-0.137	0.001	-0.003	0.884
NOL$_t$	-0.012	0.000	-0.032	0.001	-0.002	0.679
ΔNOL$_t$	-0.173	0.042	0.139	0.434	0.049	0.639
MTB$_{t-1}$	0.000	0.809	0.002	0.231	0.001	0.584
LEV$_t$	-0.037	0.115	-0.039	0.310	0.020	0.255
FCF$_t$	-0.262	0.000	-0.717	0.000	0.072	0.259
R&D$_t$	-0.381	0.000	-0.376	0.004	0.258	0.009
R^2	0.19		0.17		0.13	
N	1,454		1,454		1,454	