

DOES INSIDE DEBT MODERATE CORPORATE TAX AVOIDANCE?

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Theory suggests that inside debt held by executives in the form of deferred compensation and unfunded pensions serves to align management incentives with creditors, thereby incentivizing them to act more conservatively. Evidence in the literature suggests that creditors favor less aggressive tax avoidance strategies. Accordingly, we investigate whether the level of inside debt is associated with less corporate tax avoidance. Consistent with theoretical predictions and the high level of financial sophistication of the chief financial officer (CFO), we find that the level of inside debt for the CFO, but not chief executive officer (CEO), is associated with less tax avoidance. In addition, we find that the proximity to financial distress magnifies the inverse relation between CFO inside debt and tax avoidance. Our results are robust to numerous supplemental tests, including instrumental variables estimation and matching.

Keywords: tax avoidance, inside debt, executive compensation

JEL Codes: G32, H25, M41

I. INTRODUCTION

Deferred compensation and pensions are fixed obligations owed to executives, often referred to as inside debt. Jensen and Meckling (1976) posit that inside debt provides executives with an incentive to act more conservatively because inside debt represents a deferred, fixed claim on a firm's assets similar to those held by outside creditors. Importantly, many of these plans are non-qualified and often result in sizeable amounts owed to executives. For example, at the end of 2014, Yum! Brands, Inc. owed \$234 million of pension and deferred compensation to its chief executive officer (CEO), and Jefferies Group, Inc. owed \$201 million of pension and deferred compensation to its CEO. Thus, inside debt resembles fixed future (and often unsecured) obligations,

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essentially giving executives risk incentives similar to those of long-term bondholders. In this study, we examine whether the amount of pension and deferred compensation owed to corporate executives mitigates the incentives of managers to engage in tax avoidance.

Recent empirical studies support the theoretical predictions that high levels of inside debt motivate managers to act more conservatively (Cassell et al., 2012; Wei and Yermack, 2011; Sundaram and Yermack, 2007; Anantharaman, Fang, and Gong, 2013; Wang, Xie, and Xin, 2018). For example, Anantharaman, Fang, and Gong (2013) find that the terms of bank loan contracts among firms with higher managerial inside debt reflect a closer alignment between managerial incentives and those of creditors. With respect to tax avoidance, Hasan et al. (2014) finds that creditors impose more stringent and costly credit terms on firms engaging in greater tax avoidance, indicating that creditors favor less aggressive tax avoidance strategies. Combining these two literatures, we test whether the incentive effects of inside debt, aligning managerial interests with those of its creditors, will act to moderate the firm's tax avoidance activities. Furthermore, tax avoidance often involves complex transactions that are difficult for executives to understand, much less to evaluate, unless they have specialized expertise or direct responsibility over the tax function.¹ Hence, we expect that the incentive effect of inside debt on tax avoidance should be most evident for the chief financial officer (CFO), whose high level of accounting and financial sophistication allows for a better appreciation of the benefits and potential costs of tax avoidance (Chava and Purnanandam, 2007; Jiang, Petroni, and Wang, 2010; Anatharaman and Lee, 2013). Moreover, the CFO is responsible for supervising the accounting function and this responsibility includes oversight over tax planning.

Corporate tax policy is an important context for studying the effects of executive compensation. Besides the obvious public policy implications associated with corporate tax avoidance, taxes impact virtually every transaction within a firm and have value implications for both shareholders and creditors (Desai and Dharmapala, 2006, 2009; Hanlon and Slemrod, 2009; Kim, Li, and Zhang, 2011; Hasan et al., 2014). In addition, it is important to understand whether inside debt mitigates tax avoidance because of evidence that other devices, including governance mechanisms, only appear to constrain corporate tax policies in extreme cases (Armstrong et al., 2015). Linking inside debt with the preferences of creditors confirms speculation that executives, specifically CFOs, view aggressive tax avoidance as a potentially costly activity.² Finally, establishing the relation between inside debt and tax avoidance also provides corporate directors with a specific device to modify managerial incentives to reflect the heightened focus on the potential risks and benefits of tax planning opportunities.

¹ For example, Drucker and Bowers (2017) describe a complex tax planning strategy that Apple is using to replace the "Double Irish," a common strategy used by many multinational firms but criticized by Congress and the press.

² KPMG International (2017) concluded from a series of surveys that tax risk and tax management are becoming increasingly important to all business professionals but especially senior management and the board.

We test the association between executive inside debt and tax avoidance using a sample of firm-year observations from 2007 to 2012 with the necessary financial and compensation data. We use three measures of tax avoidance: the generally accepted accounting principles (GAAP) effective tax rate (*ETR*), the cash effective tax rate (*CETR*), and discretionary book-tax differences (*DTAX*). Besides tax avoidance, these measures collectively capture managerial discretion, which is an important element in assessing corporate strategies. Our empirical results reliably indicate that inside debt is associated with less tax avoidance, even after controlling for other sources of executive incentives. Moreover, we find 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 evaluating the costs and benefits of tax strategies requires a high level of financial sophistication.

In a supplemental test, we examine whether the proximity to financial distress magnifies the inverse relation between CFO inside debt and tax avoidance. Theory suggests that inside debt magnifies managerial effort when the firm experiences greater distress risk (Edmans and Liu, 2011). Thus, we expect that distress will magnify the incentive effect of inside debt, causing managers to view tax avoidance with greater skepticism.³ In contrast, other forms of compensation, such as equity, can induce effort to increase firm value but can also encourage risk shifting (benefiting shareholders at the expense of creditors). Thus, the incentive effect of inside debt is more effective (or less ambiguous than other forms of compensation) for firms under greater financial distress. We follow Campbell, Hilscher, and Szilagyi (2008) and Anantharaman and Lee (2014) and measure financial distress risk as the distance to default. We then augment our regression models to include this variable and interact it with inside debt, as managers with high levels of inside debt should prefer policies that are more conservative for firms with greater distress risk. We report that CFO inside debt continues to be associated with less tax avoidance and that distress risk generally magnifies this association.

We recognize that the construction of executive compensation contracts is likely endogenous to many financial decisions, and we employ several empirical strategies to address this possibility.⁴ First, we explicitly control for leverage and other determinants of tax planning that can be correlated with the agency costs of debt and tax avoidance. These other controls include proxies for the firm's historical investment and financing policies as well as future investment opportunities. Second, we use a two-stage least squares (2SLS) estimation in order to address endogeneity that can exist between the

³ We are not arguing that tax avoidance alone or even to excess (such as using illegal tax shelters) causes distress risk. Instead, based on the empirical evidence examining creditors and financial distress, we expect that creditors will be more diligent and sensitive to potential tax costs for distressed firms.

⁴ For example, 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. In addition, inside debt could be more prevalent for firms with higher agency costs of debt, and firms with high leverage might have less incentive to avoid taxes because interest tax shields can substitute for tax planning strategies (Graham and Tucker, 2006).

level of inside debt and tax avoidance. Overall, our main results are robust to these controls for endogeneity and alternative explanations.

Our study makes several important contributions to the literature. First, our research extends the existing literature on the relation between executive compensation and corporate taxes by isolating the effect of an incentive that mitigates, rather than exacerbates, tax avoidance. The bulk of the literature examines how managerial incentives encourage tax avoidance (Desai and Dharmapala, 2006; Hanlon, Mills, and Slemrod, 2007; Armstrong, Blouin, and Larcker, 2012; Rego and Wilson, 2012). In contrast, we build upon the theory of Edmans and Liu (2011) and provide evidence that incentives created by inside debt reduce firms' tax avoidance activities.

Second, we present evidence supporting the notion that incentives directed toward CFOs, rather than CEOs, influence tax avoidance. Dyreng, Hanlon, and Maydew (2010) report that certain executives are associated with greater levels of tax avoidance, but it remains uncertain whether incentives directed toward a specific executive position tend to motivate tax avoidance. Several studies report that tax avoidance is related to the incentives of tax directors or business-unit managers (Phillips, 2003; Armstrong, Blouin, and Larcker, 2012), while other studies (Rego and Wilson, 2012; Powers, Robinson, and Stomberg, 2016) report that the incentives of CEOs motivate tax avoidance. These results, however, contradict mounting evidence that CFO incentives are important for decisions relating to financial policies such as corporate taxes. For example, Jiang, Petroni, and Wang (2010) report that CFO equity incentives are more important than CEO incentives in determining earnings management via accruals. Chava and Purnanandam (2007) find that CFO incentives are more important for debt maturity policies. In addition, Anantharaman and Lee (2014) find that CFO incentives are strongly associated with pension underfunding and the risky choice of pension assets, except where the CFO's personal stake in the pension is high. We extend this literature by presenting evidence showing that CFO incentives, rather than CEO incentives, are more closely associated with tax avoidance.

Finally, we deliver new evidence linking inside debt and executive incentives to tax avoidance. In a concurrent study, Chi, Huang, and Sanchez (2017) report that the inside debt of both the CEO and the CFO is associated with the likelihood of tax sheltering. In contrast to our study, Chi, Huang, and Sanchez (2017) use estimates of the likelihood that a corporation will employ an illegal tax shelter based on Lisowsky's (2010) model. They argue that tax sheltering is an extreme form of tax avoidance and, therefore, the most likely to be affected by executive incentives.⁵ While illegal shelters can have a disproportionate effect on ETRs, multiple studies (Wilson, 2009; Lisowsky, 2010; Hanlon and Slemrod, 2009; Lisowsky, Robinson, and Schmidt, 2013) have reported that such tax shelters are rarely used by public corporations.⁶ Although we do not dispute

⁵ Lisowsky's model is based on data collected from 2000 to 2004 (before corporations fully responded to Sarbanes-Oxley legislation and before uncertain tax avoidance disclosures were mandated by FIN 48).

⁶ In contrast to these findings, the mean shelter likelihood reported by Chi, Huang, and Sanchez (2017, Appendix A) falls between 82 and 91 percent.

the possibility that CEO inside debt may play a role in the corporate decision to invest in a tax shelter, our evidence indicates that the CFO's inside debt is generally the more dominant force in mitigating tax avoidance.

II. RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

A. Compensation Contracting and Inside Debt

Stock option compensation can provide the manager with incentives to increase the volatility of cash flows, and prior research provides 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, Daniel, and Naveen (2006) show that research and development (R&D) (high-risk investment) is positively related to the vega of managerial options holdings.⁷ However, managerial equity-based compensation can aggravate the manager-creditor agency costs of debt by providing the incentive to increase firm risk (DeFusco, Johnson, and Zorn, 1990; John and John, 1993; Ortiz-Molina, 2006; Billett, Mauer, and Zhang, 2010; Brockman, Martin, and Unlu, 2010).

Jensen and Meckling (1976) hypothesize that managerial inside debt, such as deferred compensation and pensions, can align the incentives of managers with those of creditors. This is because inside debt is an unsecured, and often unfunded, obligation that puts executives in the role of a long-term bondholder. Edmans and Liu (2011) extend the intuition in Jensen and Meckling (1976) by introducing effort into the model, arguing that it is a key ingredient in understanding the effectiveness of compensating managers with equity and debt. Equity induces effort, which, despite occasional risk shifting, can increase firm value particularly when growth opportunities are more abundant. In contrast, Edmans and Liu (2011) argue that inside debt is more effective in inducing effort that will increase firm value (not just equity value) and, thereby, reduce unjustified risk.

Consistent with theory, recent studies examining inside debt document a link between inside debt and conservative investment activities and financing outcomes. For example, Cassell et al. (2012) 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 bond values (Wei and Yermack, 2011), default probability (Sundaram and Yermack, 2007), and private loan features such as covenants, syndicate structure, security, and loan pricing (Ananthara-

⁷ Option *delta* measures the change in the executive's option portfolio given a 1 percent 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, Daniel, and Naveen, 2006; Brockman, Martin, and Unlu, 2010; Armstrong et al., 2013).

man, Fang, and Gong, 2013; Wang, Xie, and Xin, 2018), as well as cash holdings (Liu, Mauer, and Zhang, 2014), bank payout policies (Srivastav, Armitage, and Hagedorff, 2014), and debt maturity (Dang and Phan, 2016). These results are consistent with inside debt aligning management's incentives with creditors and moderating management's enthusiasm for risk.

B. Tax Avoidance and Debt

Corporate taxes represent a significant cost to firms and shareholders, and tax planning has become an important strategic issue for executives. Although tax savings can increase earnings and cash flows, tax strategies also vary in terms of risk (Hanlon and Heitzman, 2010). Our focus is on risky corporate tax strategies, which we broadly refer to as "tax avoidance." The benefits, if any, from risky tax avoidance accrue to equity holders because creditors can only receive the stated interest rate when firm performance is good. However, because of interest, penalties, and the possibility of default, creditors will face substantial risk when performance is poor. Hence, given this asymmetric payout function, we expect that creditors should generally prefer less aggressive tax planning. Another possibility is that tax planning strategies incur upfront costs but the benefits depend on what happens in the future. If the firm does well, the tax planning will pay off by reducing taxes (but the creditors are paid in full given that the firm does well so they are indifferent with this outcome); if the firm does poorly, then the firm will not have a tax liability that needs to be reduced by tax planning.⁸

Consistent with this rationale, Hasan et al. (2014) test whether firms with greater tax avoidance incur higher loan spreads when obtaining bank loans. Their tests include a battery of sensitivity analyses and quasi-experimental settings, including the revelation of past tax sheltering activity. They find that tax avoidance is positively associated with higher loan spreads, more stringent non-price loan terms, higher at-issue bond spreads, and an increased likelihood of using bank loans over public bonds when obtaining debt financing. Overall, these findings indicate that creditors perceive tax avoidance as generating incremental credit risk.

Following Hasan et al. (2014), we define tax avoidance as a broad array of strategies designed to reduce explicit tax liabilities but can also induce risks. These strategies can result in greater voluntary unwinding of tax planning strategies or reversals of tax positions upon audit, resulting in greater tax liabilities and potential penalties. Although savings from tax strategies can produce immediate benefits, Rego and Wilson (2012) argue that aggressive tax avoidance also imposes substantial costs on firms and managers.⁹ Besides administrative costs, Wilson (2009) reports that penalties and interest levied on firms identified as engaging in tax sheltering activities are significant. Indeed, Hanlon and Slemrod (2009) document negative stock price reactions to a public announcement

⁸ We thank the referee for suggesting this rationale to us.

⁹ Tax strategies fall along a continuum where risk varies depending on the strategy (Hanlon and Heitzman, 2010). While certain tax strategies are virtually riskless (e.g., investing in municipal bonds), these strategies often sacrifice pretax returns (i.e., an implicit tax). Hence, to increase after-tax income, managers must consider riskier (aggressive) tax strategies.

that a firm has invested in tax shelters. Finally, besides the direct and indirect costs to the firm, failed tax planning can also aggravate financial distress risk.¹⁰ If the costs of tax avoidance are potentially significant (Hasan et al., 2014), then managers will consider the risk of triggering these costs when determining corporate tax policy and the level of inside debt should affect their appetite for risky avoidance. Building upon results from prior literature, Hasan et al. (2014) articulate three risks associated with more aggressive tax policies: information risk (reduction in information quality to minimize detection risk or hide bad news), agency risk (using complex tax strategies to hide rent diversion), and audit risk (probability that a firm's tax positions will be overturned upon audit). Thus, we posit the following hypothesis stated in alternative form.

H1: Tax avoidance will be negatively associated with the level of inside debt.

While theory supports our conjecture, empirical tests of a connection between managerial incentives and tax outcomes have provided mixed results. Robinson, Sikes, and Weaver (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, Mills, and Slemrod (2007) use a unique dataset containing confidential tax return data on Internal Revenue Service (IRS) audits and appeals and find evidence that executive bonus and equity incentive compensation are positively associated with measures of tax avoidance. Armstrong, Blouin, and Larcker (2012) also use a proprietary dataset and find that the incentive compensation of the firm's tax director is negatively associated with the GAAP ETR but unrelated to other measures of tax avoidance. Motivated by the risky nature of tax avoidance activities, Rego and Wilson (2012) examine the sensitivity of an executive's option portfolio to an increase in volatility and find that tax avoidance is positively associated with equity-based incentives to increase firm risk.

C. Financial Sophistication and Tax Avoidance

We posit that inside debt affects tax avoidance, but it is unclear whether the CEO, the CFO, or the tax director determines the overall tax strategy (Armstrong, Blouin, and Larcker, 2012).¹¹ To begin, few corporate CEOs have sufficient tax expertise to appreciate their potential costs (Dyreg, Hanlon, and Maydew, 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, 2005). Consistent with this notion, Chava and Purnanandam (2007) find

¹⁰ For example, Overseas Shipholding Group sought protection in Delaware bankruptcy court in November 2012, less than a month after announcing in a Securities Exchange Commission filing that the company might owe the IRS over \$460 million due to a "tax issue" arising from overseas operations (Church and Nightingale, 2013).

¹¹ Ideally, we would measure the effect of inside debt on tax avoidance for each of these executives. However, available data limit 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.

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.

Similarly, Jiang, Petroni, and Wang (2010) find a positive association between executive equity incentives and accrual management but also find that this association is stronger for CFOs. Moreover, Anatharaman and Lee (2014) find a positive association between pension underfunding (a form of risk shifting) and executive compensation vega, and that the estimated relation is stronger for the CFO vis-à-vis the CEO. 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. Collectively, these results suggest that the CFO's compensation characteristics are an important consideration when examining the relation between executive incentives and sophisticated financial policies, and they lead to our second hypothesis stated in alternative form.

H2: Tax avoidance will be more strongly associated with the CFO's level of inside debt.

Despite the evidence that the CFO incentives are associated with financial policies, the evidence of which executive matters for tax outcomes is less certain. Using a proprietary dataset, Armstrong, Blouin, and Larcker (2012) report that the incentive compensation of the firm's tax director, but not the CEO or CFO, is associated with ETRs. However, Powers, Robinson, and Stomberg (2016) report evidence of lower ETRs among firms led by CEOs compensated on after-tax measures of performance. This evidence contradicts Phillips (2003), who finds evidence based on survey data that lower ETRs are associated with after-tax performance measures for business-unit managers but not CEOs. Moreover, Powers, Robinson, and Stomberg, (2016) argue that, because the CEO evaluates the performance of the CFO, the CEO's incentives should dominate those of the other executives. Thus, if the average CEO has sufficient expertise to supervise the CFO's tax risk decisions, then we might find that the CEO's inside debt is empirically important. On the other hand, if the average CEO lacks sufficient tax expertise to supervise risky tax strategies, then we expect to find that the CFO's inside debt is empirically important. In addition, we recognize that H2 is a joint hypothesis with H1, and thus, we will discuss both conjectures concurrently when evaluating our results.

III. RESEARCH DESIGN

A. Sample

Our sample consists of 4,796 firm-year observations constructed primarily from the intersection of the Compustat and ExecuComp databases spanning fiscal years 2007–2012.¹² We match fiscal year $t - 1$ inside debt measures with fiscal year t tax outcomes to measure the effect of inside debt on tax avoidance. Due to inherent regula-

¹² Our sample begins in 2007 because data required to measure executive inside debt did not become available until 2006 and because we match compensation data in fiscal year $t - 1$ with tax data in fiscal year t .

tory and institutional differences, we omit utilities (two-digit SIC = 49) and financial firms (two-digit SIC = 60–69) 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.¹³

B. Variable Measurement

1. Inside Debt

Theory indicates that inside debt can alleviate the conflicts between managers and creditors, and prior research measures inside debt as the ratio of the CEO's debt-to-equity ratio to the firm's debt-to-equity ratio. This ratio captures the relative incentive

Table 1
Sample Composition

<i>Panel A. Time Distribution</i>				
Fiscal Year	Frequency	%	Cumulative Frequency	Cumulative %
2007	786	16.39	786	16.39
2008	763	15.91	1,549	32.30
2009	761	15.87	2,310	48.17
2010	864	18.02	3,174	66.18
2011	828	17.26	4,002	83.44
2012	794	16.56	4,796	100.00

<i>Panel B. Industry Distribution</i>				
Industry (One-Digit SIC)	Frequency	%	Total	Cumulative %
0–1 (Agriculture, mining, oil, and construction)	304	6.34	304	6.34
2 (Food, tobacco, textiles, paper, and chemicals)	1,049	21.87	1,353	28.21
3 (Manufacturing, machinery, and electronics)	1,559	32.51	2,912	60.72
4 (Transportation and communications)	280	5.84	3,192	66.56
5 (Wholesale and retail)	738	15.39	3,930	81.94
7 (Services)	588	12.26	4,518	94.20
8–9 (Health, legal, and educational services and other)	278	5.80	4,796	100.00

Notes: This table reports the sample distribution by fiscal year (Panel A) and industry (Panel B). The sample consists of firm-year observations with complete financial data from Compustat firms and compensation data from ExecuComp over the period 2007–2012.

¹³ Our time distribution is roughly consistent with Cassell et al. (2012), 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.

alignment between managers and creditors, with higher values reflecting more incentive alignment with creditors. The intuition is that the mix of claims held by the executive should be compared to the overall mix of claims held by the firm. Thus, a ratio equal to one implies that the executive holds a mix of claims that are perfectly aligned with claims held by the firm (Wei and Yermack, 2011).¹⁴ Thus, theory and prior research support the notion that managers with a debt-to-equity ratio greater than the firm's debt-to-equity ratio will have a greater incentive to pursue policies that transfer wealth from shareholders to bondholders. In our main specification, we use the level of the CEO and CFO's inside debt to test whether the CFO debt influences corporate tax avoidance. We compute inside debt holdings as the sum of the present value of pension benefits and deferred compensation. However, in robustness tests, we repeat our analyses using various ratio measures of relative inside debt, including those measures used in prior studies. The results using these alternative measures are consistent with our main results.

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 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.¹⁵ In other words, if inside debt affects tax strategy, then we expect to observe the effect through a firm's *ETR*. We also use a measure of discretionary book-tax differences (*DTAX*) following Frank, Lynch, and Rego (2009) to capture more aggressive forms of tax avoidance (McGuire, Omer, and Wang, 2012; Armstrong, Blouin, and Larcker, 2012).¹⁶ To summarize, lower (higher) values of effective tax rates (*DTAX*) reflect greater tax avoidance. Thus, under H1, we expect, *ceteris paribus*, to observe higher effective

¹⁴ Jensen and Meckling (1976, pp. 352–353) note that a manager with a debt-to-equity ratio equal to the firm's debt-to-equity ratio will have no incentive to pursue corporate policies that shift wealth from bondholders to shareholders (and vice versa).

¹⁵ Because the sample includes the recession period around 2009, we control for the reduction in income by scaling tax expense and cash taxes paid by total assets rather than pretax income. We find results that are consistent with those presented in the tables. As an additional test, we remove year 2009 and re-estimate our baseline regressions. With the exception of the *DTAX* regression, we find consistent results.

¹⁶ Frank, Lynch, and Rego (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 rates (*ETR* and *CETR*) and lower discretionary book-tax differences (*DTAX*) in the presence of greater inside debt. Under H2, we expect that the effect of inside debt will be more significant for the CFO than the CEO.

C. Empirical Design

We estimate the following ordinary least squares (OLS) regression to test our hypotheses:

$$(1) \quad TAX_{i,t} = \alpha_0 + \alpha_1 CEO \text{ Inside debt}_{i,t-1} + \alpha_2 CFO \text{ Inside debt}_{i,t-1} + Controls \\ + year \text{ and industry fixed effects} + \varepsilon_{i,t}.$$

Equation (1) is adapted from Chen et al. (2010) and has been used extensively in related tax research (McGuire, Omer, and Wang, 2012; Cheng et al., 2012). The idea behind Equation (1) 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.

TAX represents one of three measures of tax avoidance (*ETR*, *CETR*, or *DTAX*), and *Inside debt* represents the natural log of CEO (CFO) inside debt defined earlier. We report regressions estimating 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 $t - 1$.¹⁷ Similar to Cassell et al. (2012), 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.¹⁸ We also include the tenure of the executive, measured in year $t - 1$, to control for the potential effects of tenure on compensation structure as well as tax avoidance.

We include a wide range of controls in order to isolate the effect of our variable of interest on tax avoidance. We include a measure of financial constraints (*CONS*), which equals one if the firm has an above-median (defined by industry and fiscal year) value for the Kaplan and Zingales (1997), Whited and Wu (2006), and Hadlock and Pierce (2010) indices. Edwards, Schwab, and Shevlin (2016) find that firms facing greater financial constraints engage in more cash tax avoidance in order to ease investment funding constraints. 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

¹⁷ We measure *delta* and *vega* using the Core and Guay (2002) "one-year approximation" method. Theory and extant research in financial economics suggest higher *vega* results in greater risk-taking (Coles, Daniel, and Naveen, 2006; Brockman, Martin, and Unlu, 2010; Armstrong et al., 2013).

¹⁸ In robustness tests, we present results from 2SLS estimation and describe results from using propensity score matching and coarsened exact matching.

reporting aggressiveness (Frank, Lynch, and Rego, 2009).¹⁹ Firm size, *SIZE*, is included to control for economies of scale associated with tax planning (Erickson, Mills, and Maydew, 1998), and *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), and *FI* is computed as 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. *INTAN* equals intangible assets divided by lagged total assets. Property, plant, and equipment, *PPE*, is included 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 (Graham and Tucker, 2006; Richardson, Lanis, and Leung, 2014). *FCF* equals operating cash flow less capital expenditures divided by lagged total assets. *R&D* equals total *R&D* expense divided by lagged total assets. Fiscal year and industry (two-digit SIC) dummies are included, and standard errors are clustered by firm (Petersen, 2009).²⁰

IV. RESULTS AND DISCUSSION

A. Descriptive Statistics

Table 2 reports descriptive statistics for the variables used to estimate Equation (1). The average book effective tax rate (*ETR*) is 31 percent, and the average cash effective tax rate (*CETR*) is 27.2 percent. Consistent with prior research (Dyreg, Hanlon, and Maydew, 2008), the book *ETR* is larger than the *CETR*. Average discretionary book-tax differences (*DTAX*) represent approximately 0.8 percent 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, Lynch, and Rego, 2009; Chen et al., 2010; McGuire, Omer, and Wang, 2012; Armstrong, Blouin, and Larcker, 2012; Chyz et al., 2013).

Both the mean and median of *CEO DEBT* are significantly larger than those of *CFO DEBT*. Specifically, mean (median) *CEO* pension and deferred compensation claims are roughly \$5.3 million (\$794 thousand), whereas the mean (median) *CFO* pension and deferred compensation claims are \$1.3 million (\$138 thousand). Further, because the inside

¹⁹ We follow Frank, Lynch, and Rego (2009, p. 479) and estimate *ACC* as performance-matched pretax discretionary accruals.

²⁰ In untabulated tests, we confirm that our primary results are robust to clustering standard errors by firm and fiscal year.

Table 2
Descriptive Statistics

Variable	<i>N</i>	Mean	Std. Dev.	10th Pctl	50th Pctl	90th Pctl
Tax avoidance measures:						
<i>ETR_t</i>	4,796	0.310	0.149	0.117	0.329	0.408
<i>CETR_t</i>	4,796	0.272	0.200	0.036	0.257	0.469
<i>DTAX_t</i>	4,796	0.008	0.075	-0.058	0.002	0.074
Inside debt measures:						
<i>CEO DEBT_{t-1}</i> (\$)	4,796	5,373.9	11,046.0	0.0	794.4	15,667.9
<i>CEO DEBT_{t-1}</i>	4,796	5.2	4.0	0.0	6.7	9.7
<i>CFO DEBT_{t-1}</i> (\$)	4,796	1,322.4	3,149.5	0.0	137.6	3,935.8
<i>CFO DEBT_{t-1}</i>	4,796	4.0	3.4	0.0	4.9	8.3
<i>CFO DEBT - Pension_{t-1}</i>	4,796	2.3	3.3	0.0	0.0	7.6
<i>CFO DEBT - Defid Comp_{t-1}</i>	4,796	3.0	3.2	0.0	2.5	7.4
Other compensation variables:						
<i>CEO delta_{t-1}</i> (\$)	4,796	788.1	1,799.9	43.2	277.4	1,661.6
<i>CEO vega_{t-1}</i> (\$)	4,796	191.4	312.2	0.0	70.7	521.1
<i>CFO delta_{t-1}</i> (\$)	4,796	110.2	306.7	6.5	47.4	250.6
<i>CFO vega_{t-1}</i> (\$)	4,796	51.5	167.4	0.0	17.9	125.8
Control variables:						
<i>CEO delta_{t-1}</i>	4,796	5.609	1.457	3.790	5.629	7.416
<i>CEO vega_{t-1}</i>	4,796	3.876	2.070	0.000	4.272	6.258
<i>CEO CurrentComp_{t-1}</i>	4,796	6.764	0.574	6.150	6.752	7.409
<i>CEO Tenure_{t-1}</i>	4,796	7.955	6.694	2.000	6.000	17.000
<i>CFO delta_{t-1}</i>	4,796	3.824	1.335	2.013	3.880	5.528
<i>CFO vega_{t-1}</i>	4,796	2.763	1.663	0.000	2.941	4.843
<i>CFO CurrentComp_{t-1}</i>	4,796	6.096	0.469	5.565	6.052	6.686
<i>CFO Tenure_{t-1}</i>	4,796	2.789	1.587	1.000	3.000	5.000
<i>CONS_t</i>	4,796	0.213	0.409	0.000	0.000	1.000
<i>ROA_t</i>	4,796	0.115	0.081	0.029	0.099	0.217
<i>ACC_t</i>	4,796	-0.007	0.051	-0.066	-0.003	0.049
<i>SIZE_t</i>	4,796	7.843	1.506	6.075	7.683	9.918
<i>FI_t</i>	4,796	0.032	0.045	0.000	0.013	0.094
<i>EQINC_t</i>	4,796	0.241	0.428	0.000	0.000	1.000
<i>INTAN_t</i>	4,796	0.270	0.242	0.006	0.217	0.604
<i>PPE_t</i>	4,796	0.283	0.249	0.053	0.197	0.671
<i>NOL_t</i>	4,796	0.546	0.498	0.000	1.000	1.000
<i>ΔNOL_t</i>	4,796	0.003	0.045	-0.017	0.000	0.022
<i>MTB_{t-1}</i>	4,796	3.256	3.502	1.135	2.344	5.569
<i>LEV_t</i>	4,796	0.243	0.186	0.013	0.220	0.484
<i>FCF_t</i>	4,796	0.076	0.078	-0.008	0.074	0.166
<i>R&D_t</i>	4,796	0.025	0.041	0.000	0.002	0.086
<i>Distress_{t-1}</i>	4,786	-1.119	1.355	-2.673	-0.647	-0.124
<i>Pretax income_t</i>	4,796	840.1	2,150.7	25.3	181.2	1,826.6
<i>Total assets_{t-1}</i>	4,796	7,911.0	19,453.8	366.1	1,913.3	17,915.5

This table reports descriptive statistics for the variables used in the main analyses. Variable definitions are contained in the Appendix. Continuous variables have been winsorized at the 1% and 99% levels to mitigate the influence of outliers. Dollar figures (in thousands for compensation-related variables and in millions for pretax income and total assets) are reported for ease in interpretation.

debt and other compensation measures are right-skewed, we log-transform these measures to mitigate the influence of extreme observations. Finally, the means and medians of our control variables are consistent with extant research (Chen et al., 2010; McGuire, Omer, and Wang, 2012; Armstrong, Blouin, and Larcker, 2012; Chyz et al., 2013).²¹

B. OLS Regression Results

We estimate Equation (1) with both the CEO's and CFO's inside debt and compensation-related variables, to determine that the CFO's inside debt is the dominant force.²² We present these results in Table 3. In every specification, results confirm that the CFO's inside debt has a strong negative relation to tax avoidance (i.e., higher *ETR* and *CETR* 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 is associated with a 0.7 percent higher book effective tax rate (*ETR* regression, Column (1)), a 1.1 percent higher cash effective tax rate (*CETR* regression, Column (2)), and 0.3 percent smaller book-tax differences (*DTAX* regression, Column (3)) in the next year. These estimates roughly translate into \$5.9 million greater income tax expense, \$9.2 million greater cash taxes paid, and \$24 million smaller discretionary book-tax differences. In contrast, the coefficient estimates for CEO inside debt are all insignificant and, in the *ETR* regressions (i.e., Columns (1) and (2)), display the wrong sign. This suggests that the level of CEO inside debt has no relation to tax avoidance. Overall, these results strongly support the hypothesis that the inside debt of the CFO, but not CEO, is negatively related to tax avoidance.²³

²¹ We also report compensation-related variables, pretax income, and lagged total assets, in dollars, to further aid in comparability and interpretation. Compensation-related variables are expressed in thousands, and pretax income and lagged total assets are expressed in millions.

²² A concern with estimating Equation (1) with the CEO's and CFO's inside debt is that the high correlation between CEO and CFO inside debt (pairwise correlation is 0.77) could induce multicollinearity. In diagnostic tests, we confirm our variance inflation factors for our variables of interest (*inside debt*) are three or less and conclude that multicollinearity is not a significant concern in this specification. Further, results from estimating separate regressions in which only CEO or CFO inside debt and related compensation measures, but not both, are included in the specification consistently show that CFO (not CEO) inside debt is negatively associated with tax avoidance.

²³ We consider several alternative explanations for our results. First, we recognize the possibility that our results may be partially attributable to family ownership. This could be the case if the level of inside debt held by executives is associated with high levels of family ownership because family firms are less likely to engage in tax avoidance (Chen et al., 2010). However, using family ownership data from Anderson, Duru, and Reeb (2009) and Anderson, Reeb, and Zhao (2012), we find a relatively low correlation between family ownership and inside debt. Moreover, we find qualitatively similar results to our primary tests after controlling for family ownership. Second, in additional tests, we consider the possible effect of career concerns by controlling for labor market incentives of the CEO and CFO. Specifically, we control for the labor market incentives of the CEO by using the industry pay gap (Coles, Li, and Wang, 2018) and we control for the CFO's labor market incentives using the difference between the total compensation of the CEO and the median vice president compensation paid to other senior executives (Kale, Reis, and Venkateswaran, 2009; Kini and Williams 2012). Finally, we control for the disclosure of a debt covenant violation using the data from Roberts and Sufi (2009). We continue to find consistent results.

Table 3
The Association between CEO and CFO Inside Debt and Tax Avoidance

Dependent variable:	(1)		(2)		(3)	
	ETR_t		$CETR_t$		$DTAX_t$	
Predicted sign on inside debt:	+		+		-	
Variable	Estimate	<i>p</i> -Value	Estimate	<i>p</i> -Value	Estimate	<i>p</i> -Value
$CEO\ DEBT_{t-1}$	-0.0004	0.322	-0.0010	0.234	-0.0003	0.287
$CEO\ delta_{t-1}$	0.0063	0.022	0.0039	0.299	-0.0041	0.002
$CEO\ vega_{t-1}$	0.0030	0.168	0.0024	0.381	0.0009	0.339
$CEO\ CurrentComp_{t-1}$	0.0101	0.148	0.0095	0.292	-0.0033	0.347
$CEO\ Tenure_{t-1}$	0.0000	0.932	0.0003	0.633	-0.0001	0.490
$CFO\ DEBT_{t-1}$	0.0020	0.039	0.0033	0.028	-0.0008	0.078
$CFO\ delta_{t-1}$	0.0047	0.174	-0.0024	0.616	-0.0038	0.034
$CFO\ vega_{t-1}$	-0.0051	0.103	0.0047	0.249	0.0018	0.186
$CFO\ CurrentComp_{t-1}$	-0.0068	0.444	-0.0073	0.529	0.0027	0.538
$CFO\ Tenure_{t-1}$	0.0054	0.019	0.0002	0.944	-0.0003	0.793
$CONS_t$	0.0166	0.009	-0.0257	0.006	-0.0050	0.100
ROA_t	0.1232	0.008	-0.0421	0.547	-0.0675	0.012
ACC_t	-0.2267	0.000	-0.8763	0.000	0.0817	0.015
$SIZE_t$	-0.0081	0.008	-0.0098	0.020	-0.0004	0.741
FI_t	-0.5724	0.000	-0.1180	0.203	0.2239	0.000
$EQINC_t$	-0.0160	0.010	-0.0065	0.437	-0.0009	0.764
$INTAN_t$	0.0090	0.526	0.0110	0.576	0.0239	0.003
PPE_t	0.0095	0.579	-0.1049	0.000	-0.0056	0.555
NOL_t	-0.0093	0.063	-0.0252	0.001	0.0021	0.355
ΔNOL_t	0.0658	0.334	0.2826	0.000	0.1208	0.010
MTB_{t-1}	-0.0004	0.648	0.0017	0.175	0.0007	0.184
LEV_t	-0.0314	0.069	-0.0560	0.029	0.0130	0.161
FCF_t	-0.0991	0.053	-0.5628	0.000	0.0349	0.235
$R\&D_t$	-0.4655	0.000	-0.4757	0.000	0.2142	0.000
Industry fixed effects	Included		Included		Included	
Year fixed effects	Included		Included		Included	
R^2	0.153		0.136		0.095	
N	4,796		4,796		4,796	

This table reports results from OLS regressions in which ETR , $CETR$, and $DTAX$ are the dependent variables. For brevity, the intercept and time and industry fixed effects are not tabulated. With the exception of our variables of interest for which we have a directional prediction (bolded), all p -values are two-tailed. Standard errors are clustered by firm.

C. Financial Distress Risk

Our main results are consistent with the proposition that inside debt held by the CFO moderates corporate tax avoidance. To corroborate this result, we investigate whether the risk of default (financial distress) magnifies the relation between inside debt held by the CFO and tax avoidance. Financially distressed firms are more likely to engage in activities, such as tax avoidance, that enhance liquidity, and creditors worry that these firms will take actions that disproportionately benefit shareholders. However, managers of financially distressed firms with high levels of inside debt are also less likely to prefer risky corporate policies such as aggressive tax avoidance. Hence, we posit that interacting inside debt with financial distress risk provides a powerful test that could substantiate our main results.

To test our conjecture, we augment Equation (1) 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.²⁴ We then interact *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.²⁵ Requiring *Distress* results in 10 fewer observations than the sample used for our primary analyses, and the descriptives (untabulated) are similar.

Table 4 reports the results from OLS regressions. Columns (1)–(3) provide consistent evidence that *CFO Debt* is positively related to *ETR* and *CETR* 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. The sign of the estimated coefficient on *Distress* is negative and statistically significant for *ETR* and *CETR*. Financial distress can be viewed as a more severe manifestation of financial constraint. Viewed from this perspective, the positive association between distress and tax avoidance is consistent with prior research that reports increased tax avoidance for financially constrained firms (e.g., Edwards, Schwab, and Shevlin, 2016; Law and Mills, 2015). Importantly, the interaction term (*CFO Debt* \times *Distress*) is negatively related to tax avoidance, suggesting that distress risk has an incremental effect on the negative relation between *CFO Debt* and tax avoidance.²⁶ Overall, we interpret these results as inside debt being more effective in mitigating tax avoidance when the firm's distress risk is higher.

²⁴ We use the distance to default formula provided in the appendix of Campbell, Hilscher, and Szilagyi (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.

²⁵ We note that our sample by construction only includes firms with positive pretax income (in order to properly estimate a firm's ETR and because loss firms are in an inherently different tax position than profitable firms). Hence, our sample selection biases against finding results.

²⁶ In untabulated tests, we form quintile ranks of firms based on *Distress* and confirm that the average *ETR* for firms in the highest (lowest) quintile of distress risk is 0.306 (0.317). The similar *ETRs* indicate that firms with greater distress risk do not have comparatively fewer tax planning opportunities.

Table 4
The Association between CFO Inside Debt and Tax Avoidance Interacted with Distress

Dependent variable:	(1)		(2)		(3)	
	ETR_t		$CETR_t$		$DTAX_t$	
Predicted sign on inside debt:	+		+		-	
Variable	Estimate	<i>p</i> -Value	Estimate	<i>p</i> -Value	Estimate	<i>p</i> -Value
$CFO\ DEBT_{t-1}$	0.0023	0.028	0.0036	0.015	-0.0011	0.035
$DISTRESS_{t-1}$	-0.0106	0.000	-0.0156	0.000	0.0027	0.102
$CFO\ DEBT_{t-1} \times DISTRESS_{t-1}$	0.0008	0.023	0.0012	0.014	-0.0003	0.110
$CFO\ delta_{t-1}$	0.0060	0.077	-0.0018	0.689	-0.0051	0.003
$CFO\ vega_{t-1}$	-0.0022	0.344	0.0071	0.029	0.0023	0.039
$CFO\ CurrentComp_{t-1}$	-0.0005	0.943	-0.0015	0.871	0.0007	0.822
$CFO\ Tenure_{t-1}$	0.0047	0.041	-0.0004	0.899	-0.0002	0.850
$CONS_t$	0.0167	0.009	-0.0245	0.009	-0.0042	0.174
ROA_t	0.1258	0.007	-0.0436	0.534	-0.0717	0.009
ACC_t	-0.2257	0.000	-0.8753	0.000	0.0840	0.012
$SIZE_t$	-0.0061	0.036	-0.0100	0.009	-0.0015	0.239
FI_t	-0.5685	0.000	-0.1054	0.256	0.2217	0.000
$EQINC_t$	-0.0159	0.010	-0.0066	0.434	-0.0011	0.695
$INTAN_t$	0.0088	0.530	0.0101	0.608	0.0240	0.003
PPE_t	0.0083	0.630	-0.1050	0.000	-0.0055	0.561
NOL_t	-0.0085	0.090	-0.0245	0.001	0.0021	0.371
ΔNOL_t	0.0588	0.390	0.2710	0.001	0.1193	0.011
MTB_{t-1}	-0.0003	0.686	0.0016	0.192	0.0007	0.197
LEV_t	-0.0244	0.162	-0.0456	0.074	0.0116	0.215
FCF_t	-0.1079	0.037	-0.5744	0.000	0.0371	0.211
$R\&D_t$	-0.4643	0.000	-0.4645	0.000	0.2183	0.000
Industry fixed effects	Included		Included		Included	
Year fixed effects	Included		Included		Included	
R^2	0.151		0.137		0.091	
N	4,786		4,786		4,786	

This table reports results from interacting measures of CFO inside debt with distress risk (*Distress*). *Distress* is measured as the distance to default, multiplied by -1 and scaled by 10, following Campbell, Hilscher, and Szilagyi (2008). All other variables are defined in the Appendix. With the exception of our variables of interest for which we have a directional prediction (bolded), all *p*-values are two-tailed. Standard errors are clustered by firm.

D. Pension versus Deferred Compensation

Inside debt is composed of a mixture of pension obligations and deferred compensation. We assume that inside debt holders would want to avoid bankruptcy because these obligations would be at risk of default. However, qualified pension obligations are backed by the assets of the pension fund, and to the extent that qualified pension funds of bankrupt firms are exhausted, the Pension Benefit Guarantee Corporation (PBGC) provides some insurance. Thus, inside debt represented by qualified pension benefits could represent relatively little default risk.²⁷

To analyze whether our regression results are sensitive to the source of inside debt, we re-estimate our CFO regression after decomposing inside debt into its two components, pension and deferred compensation. The results presented in Table 5 show that CFO inside debt emanating from deferred compensation is strongly related to less aggressive tax avoidance outcomes. Specifically, a one-standard-deviation increase in the CFO's deferred compensation claims is associated with a 0.6-percentage-point higher book effective tax rate (*ETR* regression, Column (1)), a 0.7-percentage-point higher cash effective tax rate (*CETR* regression, Column (2)), and 0.16 percent smaller book-tax differences (*DTAX* regression, Column (3)) in the next year. These estimates roughly translate into \$5 million greater income tax expense, \$6 million greater cash taxes paid, and \$13 million smaller discretionary book-tax differences.

V. ROBUSTNESS

A. 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 2SLS. As noted in Cassell et al. (2012), 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 valid instruments. We need an instrument that affects CFO debt but is not correlated with the second-stage error term. That is, the instrument only operates to affect tax avoidance through CFO inside debt but not otherwise. Our instrument, *GEO CFO Debt*, 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. Prior literature has shown that compensation policies are influenced by the pay practices of geographically close firms (Kedia and Rajgopal, 2009; Bouwman, 2011). Accordingly, insofar as compensation practices of other geographically proximate firms are visible to the directors of the focal firm and can affect the CFO's compensation mix, we expect this

²⁷ We thank a referee for suggesting this possibility. However, we note that many executive pension funds are unqualified and, therefore, ineligible for PBGC protection.

Table 5
CFO Pension and Deferred Compensation and Tax Avoidance

Dependent variable:	(1)		(2)		(3)	
	ETR_t		$CETR_t$		$DTAX_t$	
Predicted sign on inside debt:	+		+		-	
Variable	Estimate	<i>p</i> -Value	Estimate	<i>p</i> -Value	Estimate	<i>p</i> -Value
<i>CFO DEBT-Pension</i>_{<i>t-1</i>}	-0.0003	0.358	-0.0001	0.480	-0.0004	0.125
<i>CFO DEBT-Defd Comp</i>_{<i>t-1</i>}	0.0018	0.024	0.0022	0.042	-0.0005	0.090
<i>CFO delta</i> _{<i>t-1</i>}	0.0062	0.067	-0.0014	0.760	-0.0054	0.001
<i>CFO vega</i> _{<i>t-1</i>}	-0.0019	0.404	0.0071	0.028	0.0025	0.025
<i>CFO CurrentComp</i> _{<i>t-1</i>}	0.0000	0.996	-0.0005	0.956	0.0000	0.990
<i>CFO Tenure</i> _{<i>t-1</i>}	0.0050	0.030	0.0003	0.926	-0.0003	0.749
<i>CONS</i> _{<i>t</i>}	0.0144	0.023	-0.0278	0.003	-0.0043	0.155
<i>ROA</i> _{<i>t</i>}	0.1247	0.008	-0.0438	0.534	-0.0722	0.009
<i>ACC</i> _{<i>t</i>}	-0.2251	0.000	-0.8741	0.000	0.0829	0.014
<i>SIZE</i> _{<i>t</i>}	-0.0044	0.124	-0.0073	0.055	-0.0019	0.117
<i>FI</i> _{<i>t</i>}	-0.5765	0.000	-0.1199	0.195	0.2235	0.000
<i>EQINC</i> _{<i>t</i>}	-0.0157	0.012	-0.0063	0.459	-0.0012	0.665
<i>INTAN</i> _{<i>t</i>}	0.0103	0.465	0.0116	0.553	0.0247	0.002
<i>PPE</i> _{<i>t</i>}	0.0078	0.650	-0.1055	0.000	-0.0054	0.568
<i>NOL</i> _{<i>t</i>}	-0.0092	0.067	-0.0252	0.001	0.0021	0.366
ΔNOL _{<i>t</i>}	0.0692	0.312	0.2836	0.000	0.1179	0.012
<i>MTB</i> _{<i>t-1</i>}	-0.0003	0.759	0.0017	0.167	0.0007	0.198
<i>LEV</i> _{<i>t</i>}	-0.0293	0.091	-0.0536	0.036	0.0130	0.159
<i>FCF</i> _{<i>t</i>}	-0.1083	0.036	-0.5691	0.000	0.0389	0.192
<i>R&D</i> _{<i>t</i>}	-0.4713	0.000	-0.4815	0.000	0.2199	0.000
Industry fixed effects	Included		Included		Included	
Year fixed effects	Included		Included		Included	
<i>R</i> ²	0.149		0.135		0.091	
<i>N</i>	4,796		4,796		4,796	

This table reports results from the regression of tax variables on CFO inside debt decomposed into the portion attributable to accrued pension benefits (*CFO DEBT-Pension*) and the portion attributable to deferred compensation (*CFO DEBT-Defd Comp*). All other variables are defined in the Appendix. With the exception of our variables of interest for which we have a directional prediction (bolded), all *p*-values are two-tailed. Standard errors are clustered by firm.

instrument will capture variation in the level of inside debt across firms. Importantly, we construct our instrument using geographically proximate firms from other industries in order to avoid the inherent bias in using industry-based instruments (Larcker and Rusticus, 2010; Gormley and Matsa, 2014). Thus, we expect the instrument will affect CFO inside debt through compensation but is unlikely to have any direct influence on tax avoidance strategy. Table 6 reports our results.

Columns (1)–(3) report results from 2SLS estimation in which our endogenous variable is *CFO Debt*. We find evidence corroborating our OLS estimates, namely, that inside debt held by the CFO is positively related to *ETR* and *CETR* and negatively related to discretionary book-tax differences. We note that the Hausman endogeneity test in the *DTAX* regressions statistic is statistically insignificant, suggesting that OLS estimates in the *DTAX* regressions are consistent. Further, we note that the Kleibergen–Paap under identification test statistics reported near the bottom of the table are all significant, rejecting the null that our system is weakly identified. Overall, results from 2SLS provide corroborating evidence that CFO inside debt in fiscal year $t - 1$ is negatively related to tax avoidance in fiscal year t .

B. Matched Pair Tests

We also use propensity score matching to isolate the effect of inside debt on tax avoidance by matching firms using compensation-related variables and market capitalization as our selection criteria. We consider observations for which the CFO's inside debt-to-equity ratio exceeds the firm's debt-to-equity ratio as treatment firms. We then estimate Equation (1) using a matched sample of 2,371 firm-years, thereby minimizing the possibility that compensation may be influencing our results. The results (untabulated) corroborate the results presented in Table 3, in that firms led by CFOs with higher inside debt engage in less tax avoidance.

We also investigate whether our results are robust to forming control groups using coarsened exact matching. Unlike propensity score matching, coarsened exact matching considers higher moments of the distributions of covariates and, in doing so, potentially results in a more accurate matching between treatment and control firms. The results (untabulated) using this alternative method of matching also corroborate the OLS results in Table 3. 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.

C. Uncertain Tax Benefits (FIN 48)

In our primary analyses, we use the book and cash effective tax rates (*ETR* and *CETR*), as well as discretionary book-tax differences (*DTAX*), in order to test our hypotheses. We also employ an additional measure using the disclosed reserves for uncertain tax benefits (*UTB*) pursuant to FIN 48 (i.e., fiscal years after 2006). The *UTB* is a contingency that represents the incremental taxes and penalties that could be imposed due to uncertain tax positions taken by the company. Specifically, we measure *UTB* as the ending balance of uncertain tax benefits scaled by pretax income. We re-estimate Equation (1) using *UTB*

Table 6
The Association between CFO Inside Debt and Tax Avoidance, 2SLS

Dependent variable:	(1)		(2)		(3)	
	ETR_t		$CETR_t$		$DTAX_t$	
Predicted sign on inside debt:	+		+		-	
Variable	Estimate	<i>p</i> -Value	Estimate	<i>p</i> -Value	Estimate	<i>p</i> -Value
$CFO\ DEBT_{t-1}$	0.0134	0.020	0.0221	0.010	-0.0049	0.040
$CFO\ delta_{t-1}$	0.0041	0.258	-0.0049	0.331	-0.0047	0.007
$CFO\ vega_{t-1}$	-0.0036	0.183	0.0043	0.246	0.0031	0.011
$CFO\ CurrentComp_{t-1}$	-0.0026	0.734	-0.0046	0.662	0.0008	0.812
$CFO\ Tenure_{t-1}$	-0.0006	0.870	-0.0091	0.095	0.0016	0.349
$CONS_t$	0.0264	0.005	-0.0077	0.567	-0.0083	0.052
ROA_t	0.1944	0.001	0.0695	0.418	-0.0939	0.002
ACC_t	-0.2944	0.000	-0.9900	0.000	0.1048	0.005
$SIZE_t$	-0.0129	0.016	-0.0217	0.005	0.0010	0.666
FI_t	-0.6250	0.000	-0.2025	0.060	0.2378	0.000
$EQINC_t$	-0.0258	0.002	-0.0230	0.055	0.0024	0.517
$INTAN_t$	0.0185	0.219	0.0256	0.236	0.0218	0.007
PPE_t	0.0084	0.636	-0.1052	0.000	-0.0061	0.517
NOL_t	-0.0086	0.097	-0.0245	0.002	0.0020	0.385
ΔNOL_t	0.0637	0.349	0.2777	0.001	0.1215	0.008
MTB_{t-1}	-0.0002	0.867	0.0019	0.127	0.0006	0.261
LEV_t	-0.0463	0.017	-0.0800	0.007	0.0195	0.047
FCF_t	-0.1423	0.010	-0.6277	0.000	0.0504	0.095
$R\&D_t$	-0.2843	0.028	-0.1671	0.340	0.1561	0.010
First stage instrument:						
$GeoCFODebt_{-1}$	0.2031	0.000	0.2031	0.000	0.2031	0.000
Industry fixed effects	Included		Included		Included	
Year fixed effects	Included		Included		Included	
Hausman exogeneity test	3.7370	0.053	5.3360	0.021	2.2810	0.131
Kleibergen–Paap LM test	31.0850	0.000	31.0850	0.000	31.0850	0.000
R^2	0.1024		0.0646		0.0701	
N	4,777		4,777		4,777	

This table reports results from 2SLS estimation in which ETR , $CETR$, and $DTAX$ are the dependent variables of interest and CFO inside debt ($CFO\ DEBT_{t-1}$) is the endogenous variable. Other variables are defined in the Appendix. For brevity, only the second stage results and instruments from the first stage are reported. Test statistics and *p*-values from Hausman's exogeneity test and Kleibergen–Paap under identification test are reported near the bottom of the table. For brevity, time and industry dummies are not tabulated. With the exception of our variables of interest for which we have a directional prediction (bolded), all *p*-values are two-tailed.

as the dependent variable of interest, and in untabulated results, we find a significantly negative coefficient estimate on measures of CFO inside debt. In contrast, we observe insignificant coefficient estimates on measures of CEO inside debt.

Employing *UTB* as an alternative measure of tax avoidance is subject to important caveats (Hanlon and Heitzman, 2010; Lisowsky, Robinson, and Schmidt, 2013). For example, Hutchens and Rego (2013) argue that *UTB* captures a measure of tax risk and is associated with an increase in the cost of equity capital.²⁸ Moreover, De Simone, Robinson, and Stomberg (2014) report wide variation in the reporting of *UTBs* for a sample of firms in the paper industry facing an identical tax issue. Thus, we only report these untabulated results as a robustness test and cautiously observe that the results are consistent with our main tests.

D. Alternative Measures of Inside Debt

In this section, we follow the convention in the literature (Cassell et al., 2012) and use various ratio measures to capture the inside debt of the executive. First, we follow prior research and measure inside debt as the ratio of the CEO's debt-to-equity ratio to the firm's debt-to-equity ratio. This ratio captures the relative incentive alignment between managers and creditors, with higher values reflecting more incentive alignment with creditors. Second, based on Wei and Yermack (2011) and Cassell et al. (2012), we measure inside debt as the "relative incentive ratio." This measure attempts to account for the duration and convexity of debt and equity claims.²⁹ Finally, we employ an indicator variable that equals one if the executive's inside debt-to-equity ratio is greater than the firm's debt-to-equity ratio. The results using these alternative measures of inside debt (untabulated) corroborate our primary results with strong and consistent evidence that the inside debt of the CFO (not the CEO) is associated with less tax avoidance.

VI. CONCLUSION

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 six years, we find a negative association between tax avoidance and inside debt levels. We also build

²⁸ We also note that data coverage for *UTB* in Compustat is incomplete.

²⁹ Cassell et al. (2012) 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 the 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 the CEO) and there are many missing observations in estimating the expected decision horizon, we choose not to use this measure in our study.

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 and 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 employ a 2SLS estimation in order to address endogeneity between the level of inside debt and tax avoidance. Third, we implement two matching techniques 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.

Although we demonstrate through several specifications that the inside debt of the CFO (but not the CEO) is negatively related to tax avoidance, we acknowledge the difficulty in establishing causal inferences in our setting. In particular, it is possible that decisions affecting compensation mix and tax outcomes are jointly determined. Although we use lagged inside debt measures in our empirical specifications, the static nature of inside debt over time makes it difficult to definitively eliminate this concern. Further, the compensation mix of the CEO and CFO may be endogenously determined through other unobserved mechanisms. However, we are unaware of any other mechanisms that would explain why the inside debt of the CFO (but not the CEO) matters for tax avoidance and why it matters more for distressed firms. Finally, our sample period lacks an exogenous intervention in inside debt that has no direct effect on tax outcomes. Although we supplement our empirical design with instrumental variables estimation and matching approaches, we recognize the difficulty in identifying strong instruments that generate exogenous variation in inside debt and we urge readers to interpret our results with these caveats in mind.

Our results contrast the conclusions reached by a contemporaneous study by Chi, Huang, and Sanchez (2017), who report that the inside debt of both the CEO and the CFO is associated with the likelihood of tax sheltering. Chi, Huang, and Sanchez (2017) measure tax avoidance using an estimate of the likelihood a corporation employs illegal tax shelters. However, given the relatively low incidence of public corporations employing illegal tax shelters, we argue that our results are more generalizable and consistent with the notion that evaluating the costs and benefits of tax strategies requires a high level of financial sophistication. 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.

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DISCLOSURE

The authors have no financial arrangement that might give rise to conflicts of interest with respect to the research reported in this paper.

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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_{it}) over pretax book income (Compustat PI_{it}).
$CETR_t$	The annual cash effective tax rate equals cash taxes paid (Compustat $TXPD$) over pretax book income (Compustat PI_{it}).
$DTAX_t$	Discretionary permanent book-tax differences computed following Frank, Lynch, and Rego (2009).
A.2. Independent Variable	
$Debt_{t-1}$	The inside debt of the CEO or CFO computed as the natural logarithm of the sum of the present value of pension and deferred compensation.
A.3. Instrumental Variable	
$GeoCFODebt_{-1}$	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	
Δ_{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).
$Currentcomp_{t-1}$	Current cash compensation (salary + bonus) paid to the CEO or CFO.
$Tenure_{t-1}$	Number of years the executive has held the position of CEO or CFO.
$CONS_t$	Equals one if the firm has an above-median (determined by industry and year) observation for the Whited–Wu (2006), Kaplan–Zingales (1997), and Hadlock–Pierce (2010) financial constraints index.
ROA_t	Return on assets equals pretax book income (Compustat PI_{it}) divided by lagged total assets (Compustat $AT_{i,t-1}$).
ACC_t	Performance-matched pretax discretionary accruals computed following the procedures in Frank, Lynch, and Rego (2009).
$SIZE_t$	Firm size computed as the natural logarithm of lagged total market value of equity (Compustat $PRCC_F_{i,t-1} \times CSHO_{i,t-1}$).
FI_t	Foreign income equals pretax income from foreign operations (Compustat $PIFO_{it}$) divided by lagged total assets (Compustat $AT_{i,t-1}$).
$EQINC_t$	An indicator variable equal to one if equity in earnings (Compustat $ESUB_{it}$) is positive.
$INTAN_t$	Intangibles (Compustat $INTAN_{it}$) divided by lagged total assets (Compustat $AT_{i,t-1}$).
PPE_t	Net property, plant, and equipment (Compustat $PPENT_{it}$) divided by lagged total assets (Compustat AT_{it}).
NOL_t	An indicator variable equal to one if the firm reports a positive tax loss carryforward during the year (Compustat $TLCF_{it}$).
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 $PRCC_F_{i,t-1} \times CSHO_{i,t-1}$) to lagged book value of equity (Compustat CEQ_{t-1}).
LEV_{t-1}	Long-term debt (Compustat $DLTT_{it}$) divided by lagged total assets (Compustat $AT_{i,t-1}$).
FCF_t	Free cash flow equals operating cash flow minus capital expenditures (Compustat $OANCF_{it} - CAPX_{it}$) scaled by lagged total assets (Compustat $AT_{i,t-1}$).
$R\&D_t$	R&D activity equals R&D expense (Compustat XRD_{it}) by lagged total assets.

DOES INSIDE DEBT MODERATE CORPORATE TAX AVOIDANCE?

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In this study, we examine whether the amount of pension and deferred compensation (inside debt) owed to corporate executives mitigates the incentives to engage in tax avoidance. It is important to understand whether inside debt mitigates tax avoidance because of evidence that other devices, including governance mechanisms, only appear to constrain corporate tax policies in extreme cases. However, theory predicts and empirical studies support the conclusion that high levels of inside debt motivate managers to act more conservatively. Because of the complexity of corporate tax matters, we expect that the incentive effect of inside debt on tax avoidance should be most evident for the chief financial officer (CFO) rather than the chief executive officer (CEO).

We examine CFO and CEO incentives from 2007 to 2012 and test the association between levels of inside debt and three alternative measures of tax avoidance: the effective tax rate (*ETR*), the cash effective tax rate (*CETR*), and discretionary book-tax differences (*DTAX*). Besides tax avoidance, these measures collectively capture managerial discretion, which is an important element in assessing corporate strategies. Our empirical results reliably indicate that inside debt is associated with reduced tax avoidance, even after controlling for other executive incentives. Moreover, we find that the association between tax avoidance and inside debt is significant for the CFO, but not for the CEO. This result contrasts with the results in a prior study that measured tax avoidance using estimates of the likelihood a corporation employs tax shelters. However, given the relatively low incidence of public corporations employing illegal tax shelters, we argue that our results are more generalizable and consistent with the notion that evaluating the costs and benefits of tax strategies requires a high level of financial sophistication.

The results of supplemental tests buttress this conclusion. We expect that financial distress will magnify the incentive effect of inside debt, causing executives to moderate their appetite for corporate tax risk. We report that CFO inside debt continues to be associated with less tax avoidance and that distress risk generally magnifies this association.

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 historical investment and financing policies as well as future investment opportunities. Second, we employ a two-stage least squares estimation in order to address endogeneity between the level of inside debt and tax avoidance. Finally, we implement propensity score matching and coarsened exact matching to estimate the sample average treatment effect on measures of tax avoidance. We find that our main results are robust to these alternative methods.

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