

# Corporate Governance, Incentives, and Tax Avoidance

Christopher S. Armstrong  
The Wharton School  
University of Pennsylvania  
[carms@wharton.upenn.edu](mailto:carms@wharton.upenn.edu)

Jennifer L. Blouin\*  
The Wharton School  
University of Pennsylvania  
[blouin@wharton.upenn.edu](mailto:blouin@wharton.upenn.edu)

Alan D. Jagolinzer  
Leeds School of Business  
University of Colorado  
[jagolinzer@colorado.edu](mailto:jagolinzer@colorado.edu)

David F. Larcker  
Graduate School of Business  
Stanford University  
[larcker\\_david@gsb.stanford.edu](mailto:larcker_david@gsb.stanford.edu)

September 2012

DO NOT QUOTE WITHOUT PERMISSION

*JEL*: G34, H25, H26, K34, M41

Keywords: Tax aggressiveness, governance, FIN 48, tax avoidance, CEO incentives

**Abstract:** This paper examines the link between corporate governance, managers' incentives, and tax avoidance. We take the perspective that tax avoidance is simply one of many investment projects faced by the firm and agency problems may cause the manager to over- or under-invest in tax avoidance relative to the desire of shareholders. Using quantile regression, we find that the impact of corporate governance on firms' tax avoidance appears to be most pronounced in the upper and lower tails of the tax avoidance distribution, which is arguably the area of most interest to researchers and regulators. Specifically, we find that more financially sophisticated and independent boards are positively associated with tax avoidance at the lower end of the tax avoidance distribution and are negatively associated with tax avoidance at the upper end of the tax avoidance distribution. This suggests that corporate governance is associated with the degree of tax avoidance by firms.

\*Corresponding author

---

We thank Shane Heitzman and workshop participants at ESADE, Goethe University, and the University of Oregon for helpful comments.

## **1. Introduction**

There has been a recent surge in research that examines cross-sectional variation in firms' tax avoidance (e.g., Shevlin, 2007; Shevlin and Shackelford, 2001; Hanlon and Heitzman, 2010). The benefits of tax avoidance can be economically large (e.g., Scholes et al., 2009) and tax avoidance can be a relatively inexpensive source of financing (e.g., Armstrong et al., 2011). However, aggressive tax avoidance may be accompanied by observable (e.g., fines and legal fees) and unobservable (e.g., excess risk and loss of corporate reputation) costs. Although understanding what influences managers' tax avoidance choices is an important research question that has public policy implications, we know relatively little about why some firms are more tax aggressive than others.

We examine whether firms' corporate governance mechanisms are related to their degree of tax avoidance. We view tax avoidance as one of managers' many investment opportunities. Similar to other investment decisions, executives may have incentives to either over- or under-invest in tax avoidance (from the perspective of a firm's shareholders) depending on their personal incentives. If there are unresolved agency problems with respect to the firm's level of tax avoidance, managers may invest either "too little" or "too much" in tax avoidance, which will result in economic losses for shareholders. In theory, appropriate corporate governance mechanisms will mitigate (in a "second-best" sense) these agency problems.

We are aware of only three papers that directly investigate the role of corporate governance on tax avoidance. Minnick and Noga (2010) investigate whether several measures of corporate governance are associated with a variety of proxies intended to capture the extent of a firm's tax avoidance, but find little evidence that governance is associated with this choice. Desai and Dharmapala (2006) report that poorly governed firms at which managers have high levels of

equity incentives engage in less tax avoidance. They interpret this result as evidence that tax avoidance and managerial rent extraction are complementary activities, which implies that the level of a firm's tax avoidance is *decreasing* in the strength of its corporate governance. Finally, Rego and Wilson (2012) find that firms at which managers have high equity-related risk-taking incentives engage in more tax avoidance, but they fail to find any evidence that firms' other governance mechanisms affect this relation. Thus, prior results linking corporate governance and managerial equity incentives to tax avoidance are quite mixed.

One common theme across prior studies is that their inferences are based on estimates of the conditional *mean* of the tax avoidance distribution, which may not be representative of the relation between governance and relatively high or low levels of tax avoidance. Rather than using traditional econometric methods that focus on either the mean (or median) association between tax avoidance and corporate governance, we utilize quantile regression to assess these relationships because we conjecture that corporate governance will have a differential impact on extreme low or high levels of tax avoidance.

In our analysis, we presume that corporate governance encompasses a broad set of actions and attributes of the board of directors. We recognize that board attributes and executive compensation packages are both mechanisms that can serve as proxies for the quality of firms' governance. Like Desai and Dharmapala (2006), we do not presume that the setting of managerial incentives is independent of firms' governance. Although the board influences CEO compensation, we believe that the board recognizes that no contract is perfect and so it must take action to reduce agency concerns.

Similar to Rego and Wilson (2012), we find that CEOs' equity risk-taking incentives exhibit a positive relationship with the level of tax avoidance. More importantly, we find that this

relationship becomes more pronounced in the right tail of the tax avoidance distribution, which is consistent with managerial risk-taking incentives. One interpretation of this observation is that high equity incentives have the potential to motivate managers to over-invest in tax avoidance relative to the desires of shareholders.

To assess the impact of corporate governance on the choice of tax avoidance, we rely on attributes of the board of directors, such as representation by financial experts and the independence of directors, as measures of the awareness of the net benefits of investment in tax avoidance and the desire to monitor managers' actions. We find that the relationship between board financial expertise/independence and firms' level of tax avoidance varies substantially across the (conditional) distribution of tax avoidance. Specifically, we observe a *positive* relation in the left tail of the tax avoidance distribution (i.e., where there is likely under investment in tax avoidance). However, this relationship is *negative* at the upper end of the tax avoidance distribution (i.e., where there is likely over investment in tax avoidance). This suggests that more financially sophisticated and independent boards recognize the potential agency problem and influence managers' tax avoidance decisions.

Consistent with Desai and Dharmapala (2006), we do not find a relation between tax avoidance and an interaction between their indicator for "good" governance and a measure of top executives' stock option compensation using ordinary least squares regression (which estimates the effect on the conditional mean). However, quantile estimation reveals that the association between tax avoidance and the interaction between "good" governance and stock option compensation is positive at the lower end of the tax avoidance distribution and turns negative at the upper end of the tax avoidance distribution. This suggests that the effect of corporate governance is observable only in the tails of the tax avoidance distribution. That is, the

interaction of executive stock option compensation and “good” corporate governance mitigates over-investment in tax avoidance when tax avoidance is high. Thus, in contrast to Desai and Dharmapala (2006), we find that corporate governance may play a more direct role in managers’ tax avoidance decisions, but primarily when the level of tax avoidance is high.

Collectively, our results provide new insights regarding the relationship between corporate governance, managers’ incentives, and tax avoidance by showing that the associations involving these variables exhibit different relationships across the tax avoidance distribution. Specifically, our evidence suggests that any impact of corporate governance on firms’ tax avoidance is strongest in the tails of the tax avoidance distribution, which is populated by firms with relatively extreme levels of tax avoidance.

The remainder of the paper is composed of six sections. In section two we develop our hypotheses related to the relation between corporate governance and tax avoidance, and how these relations may differ for different levels of tax avoidance. Section three describes our sample selection. Section four discusses our research design and explains the choice of quantile regression estimation. Section five presents our primary empirical results and inferences. Section six discusses our alternative analyses and the reports the reconsideration of Desai and Dharmapala (2006) results. Concluding remarks are presented in section seven.

## **2. Prior Literature and Hypothesis Development**

### *2.1 Prior Literature*

Early research on the taxes paid by corporations examined the determinants of effective tax rates or book-tax differences (e.g., Gupta and Newberry, 1997). Subsequent studies (e.g., Mills and Newberry, 2001 and Cloyd et al., 1996) focused on the book-tax tradeoffs of tax avoidance opportunities (i.e., some tax avoidance strategies reduce both taxable and financial statement

income, whereas others only affect taxable income). Although useful research, Shackelford and Shevlin (2001) make the important remark that this literature provides little insight regarding why some firms seem to avoid taxes using tax planning more than others.

This observation has led to the development of a series of papers that more directly examine the determinants of tax avoidance. One set of research attempts to identify measures intended to capture the level of firms tax avoidance. For example, Frank, Lynch and Rego (2009), Wilson (2009), Lisowsky (2010), and Dyreng, Hanlon and Maydew (2008) expend considerable effort developing measures of tax avoidance. Since the passage of the Financial Accounting Standards Board (FASB)'s Interpretation No. 48 (*Accounting for Uncertainty in Income Taxes*; hereafter FIN 48), several recent papers attempt to capture tax aggressiveness with firms' uncertain tax benefits (e.g., Rego and Wilson, 2012; Lisowsky et al., 2012). These measures have helped researchers better measure the construct of tax avoidance.<sup>1</sup>

Related research investigates which executive or firm attributes are associated with aggressive tax positions. For example, Dyreng et al. (2010) report evidence that executives who were previously associated with tax aggressive firms seem to import this aggressiveness to their new firms. With respect to the firm, Robinson et al., (2010) suggest that some corporate tax departments view themselves as profit centers. This suggests that firms value tax avoidance and might provide incentives for managers to engage in more tax avoidance. Prior research (e.g., Slemrod 2004; Crocker and Slemrod, 2005; Chen and Chu, 2005) suggests that corporate tax noncompliance (i.e., extreme tax avoidance) could result from the design of incentive compensation plans. Consistent with these notions, there is empirical evidence that tax avoidance

---

<sup>1</sup> As we discuss more fully later, each measure has important limitations and researchers need to carefully consider the specific attribute of tax avoidance they require in their research design (Hanlon and Heitzman, 2010).

is associated with greater levels of incentive compensation (e.g., Phillips, 2003; Armstrong et al., 2011; Rego and Wilson, 2012).

There is little research that directly examines whether or how corporate governance affects tax avoidance. This is surprising in light of evidence that the market impounds a penalty when it learns about aggressive tax avoidance (e.g., Hanlon and Slemrod, 2009). Desai and Dharmapala (2006) is the only paper, of which we are aware, that reports evidence of a relation between governance and tax avoidance. Desai and Dharmapala (2006) develop a model that links managers' equity-based compensation to aggressive tax avoidance. They conjecture that there are complementarities between tax-sheltering and rent extraction because well-governed firms are assumed to provide managers with greater incentives for tax avoidance because these firms' other governance mechanisms prevent managers from extracting the rents associated with their tax avoidance activities. However, poorly governed firms will not provide incentives for more aggressive tax avoidance because the governance mechanisms in place at these firms will be unable to prevent management from extracting the rents associated with their aggressive tax planning.

Recent work questions several of the assumptions that underlie Desai and Dharmapala's model. For example, the Desai and Dharmapala (2006) model presumes that management can extract rents derived from tax avoidance, in part, because tax avoidance requires firm operational complexity. However, the mechanism through which managers extract rents from tax avoidance is not clear and there is limited empirical evidence that managers do, in fact, extract rents through tax avoidance.<sup>2</sup> Desai and Dharmapala (2006) also implicitly assume that equity-based

---

<sup>2</sup> Desai, Dyck and Zingales (2007) report empirical evidence that Russian oligarchs appear to extract meaningful rents from firms that avoid more taxes. However, the authors do not find evidence that this is the case for Russian firms that operate in regulated (e.g., U.S.) markets. Blaylock (2011) also fails to find any evidence that managers of U.S. firms are extracting any economically meaningful rents through tax avoidance.

compensation does not mechanically create tax shields. However, Seidman and Stomberg (2011) directly challenge this assumption and report that firms with high levels of equity compensation are less likely to need incremental tax shields from tax avoidance. Seidman and Stromberg (2011) explain that Desai and Dharmapala's association between equity compensation and tax avoidance can be explained by "tax exhaustion".<sup>3</sup> Finally, Desai and Dharmapala (2006) implicitly suggest that reduced rent extraction occurs at "poorly" governed firms. However, this explanation is somewhat counterintuitive if one presumes that insiders have more opportunities to extract rents at firms with "poor" governance.

The extant literature provides some insight into the role of incentives on tax avoidance. However, the inferences are still limited regarding whether and how corporate governance affects tax avoidance. This is a particularly important research question because there are likely to be substantial economic losses for the shareholders of firms that engage in "too little" tax planning and substantial penalties associated with tax planning that is "too aggressive" (e.g., Hanlon and Slemrod, 2009).

## *2.2 Hypotheses*

### *2.2.a. Managers' incentives*

If a CEO's portfolio is sensitive to stock price and the CEO believes the expected tax savings (which may increase stock price) are larger than the potential costs of aggressive tax positions (including the cost of managerial effort), the sensitivity of CEOs' equity portfolio value to changes in stock price (i.e., equity portfolio delta) should be positively associated with tax avoidance. However, the sensitivity of CEOs' equity portfolio value to changes in stock price may be negatively associated with tax avoidance across the distribution if tax aggressiveness

---

<sup>3</sup> Graham et al. (2004) suggest that firms require fewer alternative tax shelters if they utilize more stock option grants. This "tax exhaustion" occurs because option exercises provide material tax deductions, making it less necessary to engage in alternative tax avoidance strategies.



induces greater firm risk. Armstrong et al. (2012) note that a CEO's equity portfolio delta "amplifies the effect of equity risk on the total riskiness of the manager's portfolio, generally discouraging risk-averse managers from taking risky projects." Because these present conflicting predictions, it is not *ex ante* clear whether CEOs' equity portfolio delta will be positively or negatively associated with tax avoidance across the distribution.

If CEOs believe that more aggressive tax avoidance induces greater firm risk, we expect the sensitivity of CEOs' equity portfolio value to changes in return volatility (i.e., portfolio vega) should be positively associated with tax avoidance. Moreover, the magnitude of this relationship will be greater at the upper end of the distribution where there is more risk to the firm. This prediction is similar to the one in Rego and Wilson (2012), except that we also predict a stronger relationship at higher levels of the tax avoidance distribution.

### *2.2.b. Board characteristics*

Shareholders may face different net benefits than managers with respect to tax avoidance because shareholders do not hold similar compensation incentives. Managers' compensation incentives pay more with increased risk that may compel managers to over invest in tax avoidance. However, shareholders' likely face concave net benefits from tax avoidance. That is, shareholders may derive positive net benefits from engaging in tax avoidance up to a firm-specific optimal level of tax avoidance. Beyond this point, there may be diminishing marginal returns to tax avoidance because of costs related to structuring complicated tax transactions, an inability to repatriate and invest foreign earnings, or potential political, regulatory, or reputational costs that might impact future firm operations. Some studies, for example, suggest that firms incur potential tax penalties and reputational costs (e.g., Chen et al., 2010) or face significant costs defending aggressive tax positions (e.g., Rego and Wilson, 2012). Although

there is little direct evidence supporting the existence of explicit reputational costs (e.g., Gallemore et al., 2012; Hanlon and Slemrod, 2009), there is clearly some underlying cost of extreme tax avoidance because not all firms observe extremely low effective tax rates.<sup>4</sup>

If shareholders' net benefits from tax avoidance are concave and shareholders recognize that managers may face different incentives, we might expect certain elements of governance to have a different impact on the tax avoidance decision depending upon whether the firm is above or below the "optimal" level of tax avoidance. We assume that more financially sophisticated boards can better recognize when it is appropriate to engage in or curtail more tax avoidance. This hypothesis predicts a positive (negative) relationship at the lower (upper) end of the tax avoidance distribution. Likewise, we also assume that more independent boards can better assess and help mitigate tax avoidance related agency problems (e.g., Desai and Dharmapala, 2006). This hypothesis also predicts a positive (negative) relationship at lower (upper) end of the tax avoidance distribution.

### **3. Sample Selection**

We begin with all firms listed on Compustat for the 2007-2010 fiscal years for which we have data to compute one of our primary tax position variables (*TAETR*, defined later). We delete foreign registrants and firms designated as real estate investment trusts, because these firms may be subject to different tax rules. We also delete firms with prices at or below \$1.00 and firms with average total assets during the fiscal year below \$10,000. This yields 8,933 firm-year observations. We then retain firm year observations for which we have data available for our control variables. This yields 6,345 firm-year observations. Finally, we then retain firm year

---

<sup>4</sup> The lack of evidence of significant costs of tax avoidance is frequently referred to in the literature as the "under-sheltering puzzle" (e.g., Desai and Dharmapala, 2006; Weisbach, 2002; Hanlon and Heitzman, 2010; and Gallemore et al., 2012).

observations for which we have data available for our governance and incentives variables.<sup>5</sup> This yields a final sample of 2,139 firm-year observations.<sup>6</sup>

#### **4. Research Design**

We are interested in isolating the effect of firms' governance characteristics on their degree of tax avoidance. There are two primary empirical issues. The first is the need to control for fundamental economic factors that might, in part, naturally determine a firm's tax position. The second is the need to identify whether the relationship between a firm's tax avoidance and its governance characteristics varies depending on where the relationship is measured along the distribution of tax avoidance. The relationship may vary, for example, if a firm's net benefit relating to tax avoidance is a concave function. It is likely that tax avoidance increases firm value if it makes the firm more tax efficient. However, it is also likely that there is a point at which tax positions become "too aggressive" and a further tax avoidance decreases firm value (e.g., Hanlon and Slemrod, 2009). If the net benefit to tax avoidance follows this concave pattern, then it is likely that the relationship between governance characteristics and tax avoidance varies at different points of the distribution of tax avoidance.

We control for fundamental economic determinants of a firm's tax position by including, in our analyses, variables associated with a firm's fundamental operations that affect tax positions (e.g., cash flow from operations, the level of foreign assets, the market value of equity, and the level of geographic complexity).

---

<sup>5</sup> We obtain governance and incentives data primarily from Equilar, which is similar to the ExecuComp database in that it provides executive-compensation and equity-holdings data collected from annual proxy filings (DEF 14A) with the SEC. We use Equilar data because it provides nearly 2.5 times the number of annual CEO-firm observations relative to ExecuComp.

<sup>6</sup> With respect to our other tax position variable (*EndFin48Bal*, defined later), our final yield is 2,635 observations for which we have complete data for our analyses.

To identify whether the relationship between a firm’s tax avoidance and its governance characteristics varies depending on where the relationship is measured along the distribution of tax avoidance, we estimate our analyses using quantile regression.

#### 4.1. Quantile regression

To provide evidence about the association between governance characteristics and firms’ tax avoidance, we estimate the following equation, using quantile regression.

$$\begin{aligned}
 TaxPosition_{i,t} = & \beta_{0,t} + \beta_1 LogNumFinExp_{i,t-1} + \beta_2 LogNumIndep_{i,t-1} + \\
 & \beta_3 LogCEOPortDelta_{i,t-1} + \beta_4 LogCEOPortVega_{i,t-1} + \\
 & \beta_5 CFOOps_{i,t} + \beta_6 LogMVE_{i,t} + \beta_7 LogForAssets_{i,t} + \\
 & \beta_8 GeoComp_{i,t} + \rho_{i,t},
 \end{aligned} \tag{1}$$

where *TaxPosition* is one of two proxies that measure the level of a firm’s tax avoidance for a given year, *LogNumFinExp* is the natural logarithm of one plus the number of financial experts designated on the board of directors in the year preceding the fiscal year (as indicated by either The Corporate Library or RiskMetrics); *LogNumIndep* is the natural logarithm of one plus the number of independent directors sitting on the board in the year preceding the fiscal year (as indicated by Equilar); *LogPortDelta* is the natural logarithm of the (risk-neutral) dollar change in a CEO’s equity portfolio value for a 1% increase in stock price (Core and Guay, 2002) computed for the year preceding the fiscal year; *LogPortVega*, is the natural logarithm of the (risk-neutral) dollar change in a CEO’s equity portfolio value for a 0.01 increase in annual stock return volatility, (Core and Guay, 2002) computed for the year preceding the fiscal year;<sup>7</sup> *CFOOps* is computed as cash flow from operations divided by average total assets computed for the fiscal

---

<sup>7</sup> The value of a CEO’s stock and restricted stock is assumed to change dollar-for-dollar with changes in the price of the underlying stock. The value of a CEO’s stock options is assumed to change according to the option’s delta (vega), which is the derivative of its Black-Scholes value with respect to the price (volatility). Annualized volatility is calculated using continuously compounded monthly returns over the previous 36 months, with a minimum of 12 months of returns. The risk-free rate is calculated using interpolated interest rate on a Treasury note with the same maturity, to the closest month, as the remaining life of the option multiplied by 0.70 to account for the prevalence of early exercise. Dividend yield is calculated as the dividends paid over the past 12 months scaled by the stock price at the beginning of the month.

year; *LogMVE* is the natural logarithm of market value of equity computed for the fiscal year; *LogForAssets* is the natural logarithm of total foreign assets computed for the fiscal year; *GeoComp* is a revenue-based Hirfindahl-Hirschman index that captures within-firm geographic segment complexity (Bushman et al., 2004) computed for the fiscal year; *i* denotes a firm observation, and *t* denotes the fiscal year.

Our first proxy for tax avoidance is *EndFin48Bal*, which we measure as the firm's ending balance of its uncertain tax benefit account (Compustat item TXTUBEND), scaled by its average total assets during the period.<sup>8</sup> Our second tax avoidance proxy is *TAETR*, which we calculate as the mean three-year GAAP effective tax rate (hereafter, *ETR*, computed as the firm's total tax expense scaled by pre-tax income) of the firm's size and industry peers (i.e., those in the same quintile of total assets in the same Fama-French 48 industry) less the firm's three-year GAAP *ETR*. This measure of tax avoidance captures cross-sectional variation in firms' total tax planning (including timing and permanent differences), and benchmarks a given firm's tax aggressiveness relative to that of similar-sized firms in the same industry (see Balakrishnan, Blouin and Guay, 2012).

We utilize quantile regression in addition to OLS because we expect the relationship between governance characteristics and tax avoidance to differ at different points in the tax avoidance distribution. Hao and Naiman (2007) note that OLS is inherently limited in many settings because estimates of the conditional mean cannot be readily extended to noncentral locations “which is precisely where the interests of social-science research often reside. For instance, studies of economic inequality and mobility have intrinsic interest in the poor (lower tail) and the rich (upper tail). ...Thus, the focus on the central location has long distracted researchers from

---

<sup>8</sup> De Waegenaere et al. (2010) show that that best proxy for tax avoidance activity found in the financial statements is often the FIN48 reserve.

using...relevant techniques to address research questions regarding noncentral locations on the response distribution” (p. 2). Hao and Naiman (2007) further note that “quantile regression provides a more complete understanding of how the response distribution is affected by predictors, including information about shape change. A set of equally spaced conditional quantiles (e.g., every tenth percentile of the population) can characterize the shape of the conditional distribution in addition to its central location” (p. 4).

In our setting, quantile regression provides estimates of the relationship between firms’ governance characteristics and tax aggressiveness at specified points of the distribution of the vector  $x\beta$  in the regression (Koenker and Hallock, 2001). These estimates provide a more complete picture of the relationship, particularly if the relationship changes along the distribution of the response variable.<sup>9</sup> Consistent with Koenker and Hallock, (2011), we both report and plot graphs of the coefficient estimates at decile intervals across the distribution to show how the relationship changes across the support of the distribution. We also report OLS coefficient estimates of the conditional mean for comparative purposes. In most cases, our OLS estimates show that the conditional mean does not provide a representative characterization of the nature of the relationship.

## 5. Empirical Results

Table 1 Panel A provides basic descriptive statistics for all of the variables used in our analysis. Table 1 of Panel B reports the mean level of CEO equity incentives (i.e.,

---

<sup>9</sup> Angrist and Pischke (2009) discuss a classic example of the use of quantile regression from the labor economics literature, where the researchers are interested in whether wage inequality varies conditional on wage determinants such as education and experience. In particular, they discuss how the wage gap *between* levels of education (e.g., high school versus college) has grown considerably during the past few decades. However, less is known about how the wage distribution changed *within* various educational groups and that learning about this so-called “within-group inequality” is important for understanding changes in the labor market.

*CEOPortDelta* and *CEOPortVega*) across each tax avoidance decile (where tax avoidance is measured as *EndFin48Bal*). Evidence in Table 1 Panel B indicates that CEO equity incentives tend to increase with the level of tax avoidance. This provides some evidence of potential for agency problems with respect to tax avoidance from CEO equity incentives. Finally, Table 1 Panel C reports Pearson correlation statistics regarding variables used in our analysis. Panel C provides some evidence that tax avoidance is associated with firm size, cash flow from operations, the level of foreign assets, and the geographic complexity, providing support for the need to control for these factors. Consistent with Panel B, Panel C also provides some evidence of a positive association between tax avoidance and the level of CEO incentives, potentially indicating agency problems.

Table 2 and Figure 1 present our primary evidence on the relation between governance, incentives, and tax avoidance. We first consider the degree to which CEO incentives, *LogCEOPortDelta* and *LogCEOPortVega*, might affect tax avoidance. Increased tax avoidance decreases firms' tax costs thereby likely increasing firm value. If the CEO's portfolio is sensitive to stock price and the CEO believes the certainty of tax savings outweigh the potential costs related to avoidance, then we hypothesize that *LogCEOPortDelta* will be positively associated with *TaxPosition* across the distribution. Alternatively, if more aggressive tax avoidance induces firm risk and the CEO's portfolio delta amplifies this risk within the manager's portfolio (e.g., Armstrong et al., 2012), then we hypothesize that *LogCEOPortDelta* will be negatively associated with *TaxPosition* across the distribution. If the CEO's portfolio is sensitive to firm risk and the CEO believes that tax avoidance enhances firm risk, then we hypothesize that *LogCEOPortVega* will be positively associated with *TaxPosition* across the distribution. Table 2 Panel A reports mixed results for the association between *TaxPosition* and *LogCEOPortDelta*

with OLS estimation. Therefore, it is difficult to draw inferences regarding *LogCEOPortDelta* from OLS estimation. Consistent with Rego and Wilson (2012), there is some evidence of a positive association between *TaxPosition* and *LogCEOPortVega*, with OLS estimation, specifically when *EndFin48Bal* is the tax avoidance measure.

Figure 1 Panel A, which plots coefficient estimates from Table 2 Panel A, provides a more detailed description of the association between incentives measures and *TaxPosition*. In general, the patterns depicted in Figure 1 Panel A seem to indicate that the relationship between incentives and tax aggressiveness is mostly positive and appears to grow more positive at the upper ends of the distribution, which may be indicative of potential agency problems with respect to incentives. This pattern is consistent with evidence of increasing incentives levels in the higher deciles of the tax avoidance distribution (Table 1 Panel A) and is also consistent with our hypothesis that CEO incentives with respect to firm value and risk provide incentives for firms to take more aggressive tax positions.

Figure 1 Panel B and Table 2 Panel B both report evidence regarding the association between tax avoidance and board expertise and independence. In Table 2, we report individual coefficients and *t*-statistics from both OLS estimates of the conditional mean, and quantile regression estimates of the conditional deciles of the tax avoidance distribution. We also present graphs of the quantile coefficient estimates in Figure 1 to display how the relationship between governance and tax avoidance varies across the support of the tax avoidance distribution.

We focus first on *LogNumFinExp* because it measures the degree of financial sophistication on the board. We expect that more sophisticated boards will better understand when a firm might be over or underinvested with respect to tax avoidance and therefore will have a greater effect on the firm's tax avoidance in the extremes of the tax avoidance distribution. If this hypothesis is



true, then we would expect to see a positive relationship between *LogNumFinExp* and *TaxPosition* at lower ends of the distribution, followed by a negative relationship at the upper ends of the distribution. Alternatively, we hypothesize that firms may need more financially sophisticated boards to pursue the most aggressive tax sheltering positions. If this hypothesis is true, then we would expect to see a positive relationship between *LogNumFinExp* and *TaxPosition* at both ends of the avoidance distribution. However, we would expect to see the positive association increase in the level of avoidance. Table 2 Panel B reports some evidence of a negative relationship between *TaxPosition* and *LogNumFinExp* using OLS estimation, particularly when *TAETR* is the tax avoidance measure. One might infer from this that tax avoidance is systematically lower when there is more financial expertise on the board. However, this interpretation seems incomplete when one considers the quantile regression coefficient estimates in Table 2 and the associated graph of these estimates in Figure 1. In particular, for both tax avoidance proxies, Figure 1 shows that the relationship between the financial expertise of the board and tax avoidance varies at different points of the tax avoidance distribution. Specifically, there is evidence that the association between tax avoidance and board financial sophistication is positive at low levels of the tax avoidance distribution but becomes negative at high levels of tax avoidance. This result is consistent with our hypothesis and suggests that board sophistication has a differential effect on tax avoidance for firms that appear to be under-sheltering versus those who are potentially overly aggressive.

We next consider *LogNumIndep* because it characterizes the potential independence of the board, which may affect agency issues at the firm. Desai and Dharmapala (2006) suggest that agency issues might arise with respect to tax avoidance which could occur, for example, if shareholders' net benefits from tax avoidance are concave and managers face different

incentives. If more independent boards can better recognize and help mitigate agency problems, then we would predict a positive (negative) relationship at lower (upper) end of the tax avoidance distribution.

Table 2 Panel B reports some evidence of a negative relationship between *TaxPosition* and *LogNumIndep* using OLS estimation, particularly when *EndFin48Bal* is the tax avoidance measure. One might infer from this that tax avoidance is systematically lower when there is more board independence. However, this interpretation seems incomplete when one considers the quantile regression coefficient estimates in Table 2 and the associated graph of these estimates in Figure 1. In particular, for both tax avoidance proxies, Figure 1 shows that the relationship between board independence and tax avoidance varies at different points of the tax avoidance distribution. Specifically, there is evidence that the association between tax avoidance and board independence is positive at low levels of the tax avoidance distribution but becomes increasingly negative at high levels of tax avoidance. This result is consistent with our hypothesis and suggests that board independence has a differential effect on tax avoidance for firms that appear to be under-sheltering versus those who are potentially over-sheltering. This pattern would be consistent with our hypothesis that more independent boards mitigate agency problems associated with more aggressive tax positions.

## **6. Alternative Analyses**

### *6.1 Sensitivity analyses*

There is considerable debate in the tax avoidance literature about appropriate measures for tax avoidance. Therefore we assess the sensitivity of our results to a number of alternative tax avoidance measures, including a modified version of Frank et al.'s (2009) *DTAX* measure of

discretionary permanent tax differences and *EffUTB*, which is measured as the portion of the firm's uncertain tax benefit that, if reversed, would increase the firm's effective tax rate.<sup>10</sup> Results (untabulated) are similar with these alternative tax measures.

For sensitivity, we also control for standard economic determinants of the firm's tax position (e.g., *CFOOps*, *LogMVE*, *LogForAssets*, and *GeoComp*) using propensity score matching. Armstrong, Jagolinzer, and Larcker (2010) suggest that propensity score matching relaxes (likely inaccurate) assumptions about the functional form of the relationship between tax avoidance and control variables. Thus, it is possible to obtain better control for these variables through this matching procedure. We compute a propensity score by first extracting a governance factor using principal components analysis for the governance variables in equation (1). We then regress the governance factor on *CFOOps*, *LogMVE*, *LogForAssets*, and *GeoComp* to obtain a fitted-value propensity score. Finally, to help control for general economic determinants of firms' tax positions, we match firms using a non-bipartite algorithm that identifies pairs with the greatest distance in *GovFactor* (to retain variation in governance characteristics, our focus of interest) and the smallest distance in the propensity score. We then estimate equation (1), without including the already-matched control variables, to draw inferences regarding the association between governance and tax positions. Results (untabulated) are similar to those presented in Table 2 and Figure 1.

## 6.2 *Desai and Dharmapala (2006)*

---

<sup>10</sup> Frank et al. (2009) compute *DTAX* as the residual from a regression of an estimate of permanent differences on measures of intangible assets, income of unconsolidated subsidiaries, minority interest, state tax burdens, changes in NOLs, and lagged permanent differences. We modify this computation by including Oler et al.'s (2007) measure of foreign assets (*LogForAssets*) to control for the existence of multinational operations. By including foreign assets in the first stage, we attempt to control for ETR differentials that result from "ordinary" overseas operations. Without this modification, *DTAX* would suggest that firms with extensive foreign operations or foreign operations in low tax jurisdictions are always more aggressive tax planners. All reported results are robust to excluding foreign assets and measuring *DTAX* exactly as described by Frank et al. (2009). Our *DTAX* measure is scaled by the firm's average total assets during the period.

Desai and Dharmapala (2006) present widely-cited evidence that their measures of governance and executive incentives have an interactive average effect on the level of firms' tax aggressiveness. Specifically, they provide evidence (Table 4) that there is no statistical relation between their measure of tax aggressiveness and the ratio of annual stock option grant value to total compensation for the firm's top five executives for firms that have a low governance index score (i.e., "well governed" firms).<sup>11</sup> However, they report a statistically negative association between their measure of tax aggressiveness and the ratio of stock option grant value to total compensation for the firm's top five executives for firms that have a high governance index score (i.e., "poorly governed" firms). We can generally replicate this result (i.e., Table 4 Column (4) of Desai and Dharmapala, 2006) in our sample.<sup>12</sup>

Desai and Dharmapala (2006) present a discussion of why it is not clear *ex ante* whether equity compensation provides incentives for managers to engage in greater or lower tax aggressiveness strategies. They also consider that it is reasonable to expect that the degree to which equity compensation provides tax aggressiveness incentives is a function of other elements of the firm's governance environment since various governance mechanisms can complement and substitute for each other. It is difficult, however, to fully understand the nature of these relationships by examining only the conditional mean of the tax aggressiveness distribution. Therefore, we reestimate Desai and Dharmapala's (2006) Table 4 Column (4) model using quantile regression to determine whether the conditional average effect that they document is representative of the effect at other points in the distribution or, instead, whether the relationship varies as suggested by our primary results documented in Figure 1 and Table 2.

---

<sup>11</sup> Desai and Dharmapala (2006) measure tax aggressiveness as the residual estimated from regressing the difference between book and tax income on total accruals (see their discussion, p. 159-160). The authors also rely on the Gompers et al. (2003) "G-index", which is primarily a measure of shareholder rights, as their measure of governance quality.

<sup>12</sup> Tabulated results in Table 4 Column (4) do not indicate statistical significance for the interaction coefficient.

Figure 2 and Table 3 provide evidence regarding quantile regression of Desai and Dharmapala's (2006) Table 4 Column (4) estimation.<sup>13</sup> With OLS estimation, we are generally able to replicate Desai and Dharmapala's result of a negative coefficient for the ratio of stock option grant values and a positive (but insignificant) coefficient when this ratio is interacted with a dichotomous variable that equals one for "well governed" firms. When we examine the relationship with quantile regression, however, we observe that the interactive effect of executive equity grants and well governed firms appears to vary across the distribution of tax aggressiveness. Specifically, we find that this relation is negative in the right tail of tax the avoidance distribution, which suggests that one or both factors provide incentives to *avoid* aggressive tax positions when these positions may induce net costs. This is consistent with our hypotheses and the results documented in Figure 1 and Table 2.

## 7. Conclusion

This paper examines how managers' incentives and firms' corporate governance mechanisms are associated with their tax avoidance by focusing on the relationships at the extreme tails of the tax avoidance distribution, where governance mechanisms are most likely to have an effect. In contrast to prior studies that only estimate (and therefore can only draw inferences regarding) the relationship at the conditional mean, we estimate quantile regression, which allows us to observe shifts in the relationship across the various quantiles of the conditional tax avoidance distribution. Our ability to observe shifts in the relationship is particularly important in this setting because governance likely affects tax avoidance differently along the distribution if the net benefits of tax avoidance exhibit diminishing marginal returns.

---

<sup>13</sup> For completeness, we include a mean-effect "well-governed firm" dichotomous variable in this estimation, which is not included in Desai and Dharmapala (2006).

Consistent with the hypothesis that management expects greater personal payoffs to increased tax avoidance (e.g., Rego and Wilson, 2012), we find evidence that firms with greater performance and risk-based incentives appear to engage in greater tax avoidance, particularly at the upper end of the tax avoidance distribution. This might suggest that high equity incentives have the potential to motivate managers to over-invest in tax avoidance relative to the desires of shareholders. We also find evidence that board financial sophistication and independence exhibit a positive (negative) relationship with tax avoidance at the lower (upper) end of the tax avoidance distribution. This is consistent with the hypothesis that more sophisticated and independent boards recognize the concavity that underlies the net benefits to tax aggressiveness and mitigate potential agency problems. Finally, we observe that it seems more informative to assess the effect on tax avoidance of governance interacted with management incentives at the extreme tails of the tax avoidance distribution. Consistent with our prior results, we find that “well-governed” firms that have greater incentives are associated with lower tax avoidance at the upper tail of the tax avoidance distribution. This finding seems more intuitive and seems to hold more statistical significance than the findings in prior literature that assesses this relationship at the conditional mean of the distribution (e.g., Desai and Dharmapala, 2006).

Collectively, our study provides a richer understanding of how management incentives and corporate firm governance mechanisms may affect firms’ tax avoidance. Perhaps more importantly, our study provides evidence that seems to confirm that the net benefits to tax avoidance are, in fact, concave. Although our results do not speak to specific costs associated with aggressive tax avoidance, our evidence should help researchers better understand what prevents all firms from reaching the “corner solution” of maximum tax avoidance (i.e., a zero effective tax rate).

## **References**

- Angrist, J. D. and J. S. Pischke, 2009. Mostly harmless econometrics. Princeton University Press.
- Armstrong, C. A., Jagolinzer, A. D., and D. F. Larcker, 2010. Chief Executive Officer Equity Incentives and Accounting Irregularities. *Journal of Accounting Research* 48: 225-271.
- Armstrong, C. A., Guay, W. R., and J. P. Weber, 2011. The role of information and financial reporting in corporate governance and debt contracting. *Journal of Accounting and Economics* 50: 179-234.
- Armstrong, C. A., Larcker, D. F., Ormazabal, G., and D. J. Taylor, 2012. The relation between equity incentives and misreporting: the role of risk-taking incentives. Working paper, Stanford Graduate School of Business.
- Balakrishnan, K., Blouin, J., and W. Guay, 2012. Does tax aggressiveness reduce corporate transparency? Working paper, University of Pennsylvania.
- Blaylock, B., 2011. Do managers extract economically significant rents through tax aggressive transactions? Working paper, Oklahoma State University.
- Bushman, R., Chen, Q., Engel, E., and A. Smith, 2004. Financial accounting information, organizational complexity and corporate governance systems. *Journal of Accounting and Economics* 37: 167-201.
- Chen, K. P. and C. Y. C. Chu, 2005. Internal control vs. external manipulation: a model of corporate income tax evasion. *RAND Journal of Economics* 36: 151-164.
- Chen, S., Chen, X., Cheng, Q., and T. Shevlin, 2010. Are family firms more tax aggressive than non-family firms? *Journal of Financial Economics* 95: 41-61.
- Cloyd, C. B., Pratt, J., and T. Stock, 1996. The use of financial accounting choice to support aggressive tax positions: public and private firms. *Journal of Accounting Research* 34: 23-43.
- Core, J. E., and W. R. Guay, 2002. Estimating the value of employee stock option portfolios and their sensitivities to price and volatility. *Journal of Accounting Research* 40: 613-630.
- Crocker, K. and J. Slemrod, 2005. Corporate tax evasion with agency costs. *Journal of Public Economics* 89: 1593-1610.
- Desai M. A., and D. Dharmapala, 2006. Corporate tax avoidance and high-powered incentives. *Journal of Financial Economics* 79: 145-179.
- Desai M. A., and D. Dharmapala, 2008. Taxation and corporate governance: An economic approach. *Max Planck Institute Studies on Intellectual Property, Competition and Tax Law*, (ed. Wolfgang Schon), Volume 3, 13-30.
- Desai M. A., and D. Dharmapala, 2009. Corporate tax avoidance and firm value. *Review of Economics and Statistics* 91(3), 537-546.
- Desai, M., and A. Dyck, and L. Zingales. 2007. Theft and taxes. *Journal of Financial Economics* 84, 591-623.
- De Waegenare, A., R. Sansing, and J. Wielhouwer. 2010. Financial accounting measures of tax reporting aggressiveness. Working paper, Tilburg University.

- Dyreng, S., M. Hanlon and E. Maydew. 2008. Long-run corporate tax avoidance. *The Accounting Review* 83(1): 61-82.
- Dyreng, S., M. Hanlon and E. Maydew. 2010. The effects of managers on corporate tax avoidance. *The Accounting Review* 85(4): 1163-1189 .
- Frank, M. M., Lynch, L., and S. Rego, 2009. Tax reporting aggressiveness and its relation to aggressive financial reporting. *The Accounting Review* 84: 467-496.
- Gallemore, J., Maydew, E. L., and J. R. Thornock, 2012. The reputational costs of tax avoidance and the under-sheltering puzzle. Working paper, the University of North Carolina.
- Gompers, P., J. Ishii, and A. Metrick, 2003. Corporate governance and equity prices. *The Quarterly Journal of Economics* February: 107-155.
- Gupta, S. and K. Newberry, 1997. Determinants of the variability in corporate effective tax rates: evidence from longitudinal data. *Journal of Accounting and Public Policy* 16: 1-34.
- Hanlon, M. and J. Slemrod, 2009. What does tax aggressiveness signal? Evidence from stock price reactions to news about tax shelter improvement. *Journal of Public Economics* 93: 126-141.
- Hanlon, M. and S. Heitzman, 2010. A review of tax research. *Journal of Accounting and Economics* 50: 127-178.
- Hao, L., and D. Q. Naiman, 2007. Quantile regression. Sage publishing.
- Harris, M. and A. Raviv, 2008. A theory of board control and size. *Review of Financial Studies* 21: 1797-1832.
- Ho, D. E., Imai, K., King, G., and E. A. Stuart, 2007. Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis* 15: 199-236.
- Koenker, R., and K. F. Hallock, 2011. Quantile regression. *Journal of Economic Perspectives* 15: 143-156.
- Lisowsky, P. 2010. Seeking shelter: Empirically modeling tax shelters using financial statement information. *The Accounting Review* 85, 1693-1720.
- Lisowky, P., L. Robinson and A. Schmidt. 2012. Do publicly disclosed tax reserves tell us about privately disclosed tax shelter activity? Working paper, University of Illinois.
- Mills, L. and K. Newberry, 2001. The influence of tax and nontax costs on book-tax reporting differences: public and private firms. *Journal of the American Taxation Association* 23: 1-19.
- Minnick, K. and T. Noga. 2010. Do corporate governance characteristics influence tax management? *Journal of Corporate Finance* 16, 703-718.
- Oler, M., Shevlin, T., and R. Wilson. Examining investor expectations concerning tax savings on the repatriations of foreign earnings under the American Jobs Creation Act of 2004. *Journal of the American Taxation Association* 29: 25-55.
- Phillips, J. D., 2003. Corporate tax planning effectiveness: the role of compensation-based incentives. *The Accounting Review* 78: 847-874.
- Rego, S. O., and R. Wilson, 2012. Equity risk incentives and corporate tax aggressiveness. *Journal of Accounting Research* 50: 775-810.



- Robinson, R., Sikes, S., and C. Weaver, 2010. Performance measurement of corporate tax departments. *The Accounting Review* 85: 1035-1064.
- Scholes, M. S., Wolfson, M. A., Erickson, M. M., Maydew, E. L., and T. J. Shevlin, 2009. *Taxes and business strategy: a planning approach*, Prentice Hall.
- Seidman, J. and B. Stomberg, 2011. Why are option compensation and tax sheltering negatively related? Working paper, University of Texas.
- Shevlin, T., 2007. The future of tax research: From an accounting professor's perspective. *Journal of the American Taxation Association* 29: 87-93.
- Shevlin, T. and D. A. Shackelford, 2001. Empirical tax research in accounting. *Journal of Accounting and Economics* 31: 321-387.
- Slemrod, J., 2004. The economics of corporate tax selfishness. *National Tax Journal* 57:877-899.
- Weisbach, D., 2002. Ten truths about tax shelters. *Tax Law Review* 55: 215-253.
- Wilson, R. 2009. An examination of corporate tax shelter participants. *The Accounting Review* 84(3), 969-999.



**Table 1**  
**Panel A: Descriptive Statistics**

	<i>n</i>	Mean	Standard Deviation	Median
<b><u>Tax Position</u></b>				
<i>EndFin48Bal</i>	2,635	0.015	0.022	0.009
<i>TAETR</i>	2,254	-0.034	0.201	-0.038
<b><u>Governance and Incentives</u></b>				
<i>NumFinExp</i>	2,635	1.571	1.283	1.000
<i>NumIndepDir</i>	2,635	6.883	2.230	7.000
<i>CEOPortDelta</i> (\$)	2,635	327,966	653,242	113,951
<i>CEOPortVega</i> (\$)	2,635	21,350	60,589	966
<b><u>Controls</u></b>				
<i>CFOOps</i>	2,635	0.102	0.098	0.100
<i>MVE</i> (\$millions)	2,635	8,283	26,967	1,485
<i>ForAssets</i> (\$millions)	2,635	5,196	66,114	298
<i>GeoComp</i>	2,635	0.668	2.304	0.559

**Table 1**  
**Panel B: Mean Incentives by Tax Avoidance Decile**

<i>EndFin48Bal</i> <i>Decile</i>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Incentives</b>										
<i>CEOPortDelta</i> (\$)	159,733	179,648	259,345	266,048	386,210	330,621	374,724	372,726	450,331	500,305
<i>CEOPortVega</i> (\$)	15,483	11,428	17,480	19,323	19,390	29,816	15,994	21,112	27,712	35,801

**Table 1 (cont'd)**  
**Panel C: Pearson Correlations**  
*correlation coefficient*  
*p-value*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>EndFin48Bal (1)</i>	1.0000	0.1275	-0.0375	-0.0007	0.0531	0.0685	0.0401	-0.0313	0.1381	-0.0351
		<.0001	0.0544	0.9735	0.0064	0.0004	0.0398	0.1083	<.0001	0.0718
<i>TAETR (2)</i>	0.1275	1.0000	0.0139	-0.0811	-0.0889	0.0537	-0.0784	-0.1445	0.0290	-0.0315
	<.0001		0.5553	0.0006	0.0002	0.0227	0.0009	<.0001	0.2193	0.1814
<i>LogNumIndep (3)</i>	-0.0375	0.0139	1.0000	0.2780	0.2615	0.0568	0.4810	0.0065	0.3200	-0.0296
	0.0544	0.5553		<.0001	<.0001	0.0035	<.0001	0.7386	<.0001	0.1294
<i>LogNumFinExp (4)</i>	-0.0007	-0.0811	0.2780	1.0000	0.3437	-0.1001	0.4412	0.1402	0.2171	-0.0526
	0.9735	0.0006	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001	0.0069
<i>LogCEOPortDelta (5)</i>	0.0531	-0.0889	0.2615	0.3437	1.0000	-0.1699	0.6951	0.2552	0.3428	-0.0049
	0.0064	0.0002	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001	0.8000
<i>LogCEOPortVega (6)</i>	0.0685	0.0537	0.0568	-0.1001	-0.1699	1.0000	-0.2303	-0.1066	-0.0409	0.0369
	0.0004	0.0227	0.0035	<.0001	<.0001		<.0001	<.0001	0.0359	0.0582
<i>LogMVE (7)</i>	0.0401	-0.0784	0.4810	0.4412	0.6951	-0.2303	1.0000	0.2748	0.4726	-0.0332
	0.0398	0.0009	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	0.0881
<i>CFOOps (8)</i>	-0.0313	-0.1445	0.0065	0.1402	0.2552	-0.1066	0.2748	1.0000	0.0575	-0.0118
	0.1083	<.0001	0.7386	<.0001	<.0001	<.0001	<.0001		0.0031	0.5464
<i>LogForAssets (9)</i>	0.1381	0.0290	0.3200	0.2171	0.3428	-0.0409	0.4726	0.0575	1.0000	-0.0740
	<.0001	0.2193	<.0001	<.0001	<.0001	0.0359	<.0001	0.0031		0.0001
<i>GeoComp (10)</i>	-0.0351	-0.0315	-0.0296	-0.0526	-0.0049	0.0369	-0.0332	-0.0118	-0.0740	1.0000
	0.0718	0.1814	0.1294	0.0069	0.8000	0.0582	0.0881	0.5464	0.0001	

*EndFin48Bal* is measured as the firm's ending balance of the uncertain tax benefit account (Compustat TXTUBEND), scaled by the firm's average assets over the period. *TAETR* is computed as the mean three-year GAAP *ETR* (computed as the firm's total tax expense scaled by pre-tax income) of the firm's size and industry peers minus the firm's three-year GAAP *ETR*. Size peers are firms within the same quintile of total assets and industry peers are firms within the same Fama-French 48 industry portfolios. *LogNumIndep* is the natural logarithm of one plus the number of independent directors sitting on the board in the year preceding the fiscal year (as indicated by Equilar). *LogNumFinExp* is the natural logarithm of one plus the number of financial experts designated on the board of directors in the year preceding the fiscal year (as indicated by either The Corporate Library or RiskMetrics). *CEOPortDelta* (*CEOPortVega*) is the (risk-neutral) dollar change in the firm CEO's equity portfolio value for a 1% change in the value (volatility) of the firm's stock price (Core and Guay, 2002). *LogCEOPortDelta* (*LogCEOPortVega*) is the natural logarithm of *CEOPortDelta* (*CEOPortVega*). *LogMVE* is the natural logarithm of market value of equity computed for the fiscal year. *CFOOps* is cash flow from operations divided by average total assets. *LogForAssets* is the natural logarithm of total foreign assets computed for the fiscal year. *GeoComp* is a revenue-based Hirfindahl-Hirschman index that captures within-firm geographic segment complexity (Bushman et al., 2004) computed for the fiscal year.

**Table 2**

**Panel A: CEO Incentives**

<i>TaxPosition =</i> <i>n =</i> <i>X =</i>	<i>EndFin48Bal</i> 2,635 <i>LogCEOPortDelta</i>		<i>TAETR</i> 2,139 <i>LogCEOPortDelta</i>		<i>EndFin48Bal</i> 2,635 <i>LogCEOPortVega</i>		<i>TAETR</i> 2,139 <i>LogCEOPortVega</i>	
	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat
<i>OLS</i>	0.0004	1.42	-0.0054	-1.80	0.0004	4.51	0.0010	0.97
<i>Quantile</i>								
<i>0.10</i>	0.0001	1.82	-0.0104	-3.49	0.0000	2.08	-0.0017	-1.00
<i>0.20</i>	0.0002	2.27	-0.0040	-1.37	0.0001	1.69	0.0005	0.49
<i>0.30</i>	0.0003	2.54	-0.0033	-1.58	0.0001	1.98	0.0012	1.74
<i>0.40</i>	0.0002	1.56	-0.0022	-1.22	0.0001	2.31	0.0015	2.11
<i>0.50</i>	0.0003	1.93	-0.0028	-1.18	0.0001	2.13	0.0016	2.40
<i>0.60</i>	0.0003	1.60	-0.0056	-2.36	0.0003	3.62	0.0017	2.25
<i>0.70</i>	0.0003	0.84	-0.0051	-1.74	0.0003	3.46	0.0027	2.71
<i>0.80</i>	0.0002	0.63	-0.0014	-0.42	0.0006	4.76	0.0032	2.29
<i>0.90</i>	0.0006	1.16	-0.0023	-0.68	0.0009	3.91	0.0026	2.35

**Panel B: Board Expertise and Independence**

<i>TaxPosition =</i> <i>n =</i> <i>X =</i>	<i>EndFin48Bal</i> 2,635 <i>LogNumFinExp</i>		<i>TAETR</i> 2,139 <i>LogNumFinExp</i>		<i>EndFin48Bal</i> 2,635 <i>LogNumIndep</i>		<i>TAETR</i> 2,139 <i>LogNumIndep</i>	
	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat
<i>OLS</i>	-0.0007	-0.80	-0.0200	-2.08	-0.0083	-5.04	0.0045	0.28
<i>Quantile</i>								
<i>0.10</i>	0.0005	3.35	0.0062	0.36	0.0002	0.75	-0.0227	-0.71
<i>0.20</i>	0.0007	2.22	-0.0005	-0.04	-0.0003	-0.73	0.0282	1.44
<i>0.30</i>	0.0008	2.01	-0.0007	-0.92	0.0002	0.31	0.0311	2.65
<i>0.40</i>	0.0004	1.01	-0.0147	-1.99	-0.0004	-0.75	0.0244	2.58
<i>0.50</i>	0.0003	0.53	-0.0205	-2.56	-0.0018	-1.75	0.0193	1.60
<i>0.60</i>	0.0006	0.85	-0.0291	-3.90	-0.0036	-3.05	0.0177	1.46
<i>0.70</i>	-0.0001	-0.08	-0.0220	-2.26	-0.0050	-2.71	-0.0097	-0.56
<i>0.80</i>	-0.0017	-1.14	-0.0174	-1.47	-0.0038	-1.39	-0.0156	-0.80
<i>0.90</i>	-0.0052	-2.24	-0.0305	-2.66	-0.0263	-4.80	-0.0175	-0.96

*EndFin48Bal* is measured as the firm's ending balance of the uncertain tax benefit account (Compustat TXTUBEND), scaled by the firm's average assets over the period. *TAETR* is computed as the mean three-year GAAP *ETR* (computed as the firm's total tax expense scaled by pre-tax income) of the firm's size and industry peers minus the firm's three-year GAAP *ETR*. Size peers are firms within the same quintile of total assets and industry peers are firms within the same Fama-French 48 industry portfolios. *LogNumIndep* is the natural logarithm of one plus the number of independent directors sitting on the board in the year preceding the fiscal year (as indicated by Equilar). *LogNumFinExp* is the natural logarithm of one plus the number of financial experts designated on the board of directors in the year preceding the fiscal year (as indicated by either The Corporate Library or RiskMetrics). *CEOPortDelta* (*CEOPortVega*) is the (risk-neutral) dollar change in the firm CEO's equity portfolio value for a 1% change in the value (volatility) of the firm's stock price (Core and Guay, 2002). *LogCEOPortDelta* (*LogCEOPortVega*) is the natural logarithm of *CEOPortDelta* (*CEOPortVega*).

**Figure 1**  
**Panel A: CEO Incentives**

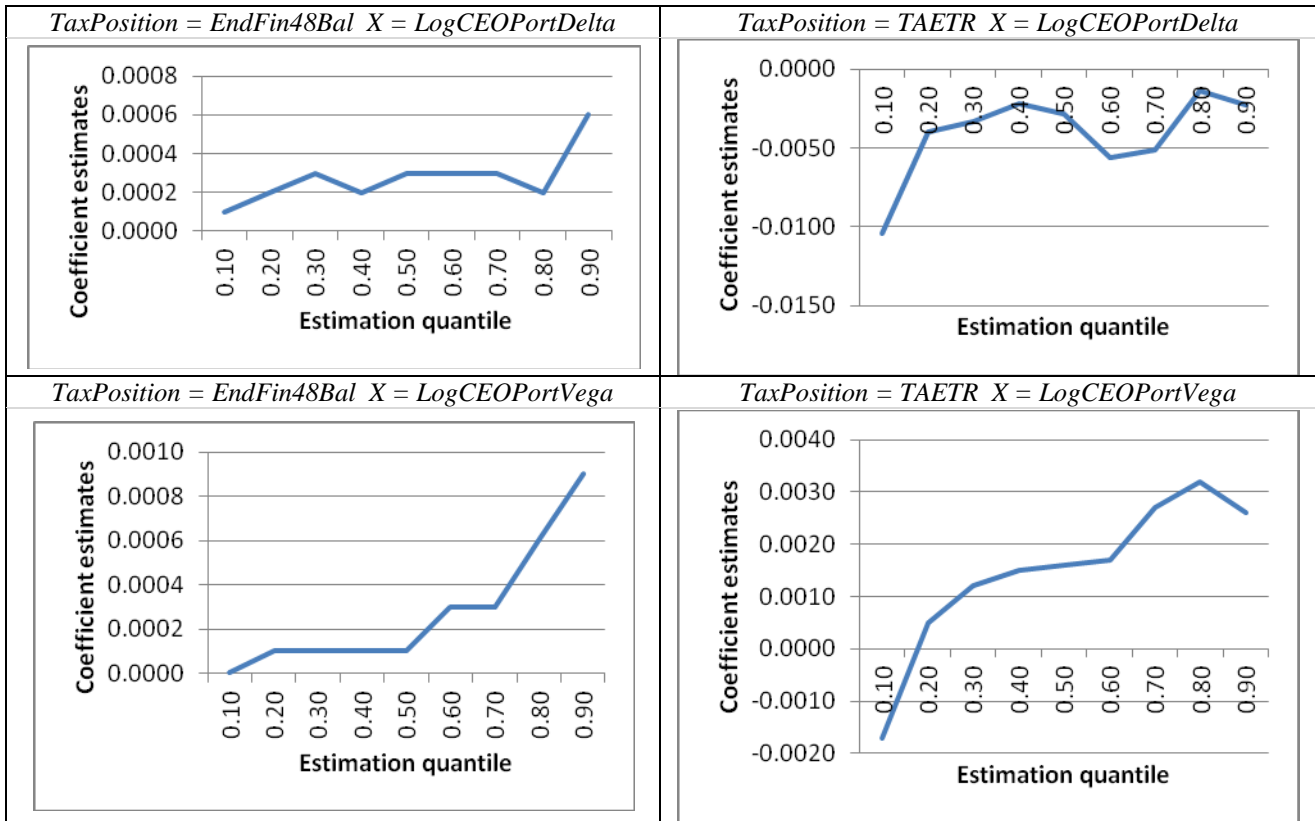
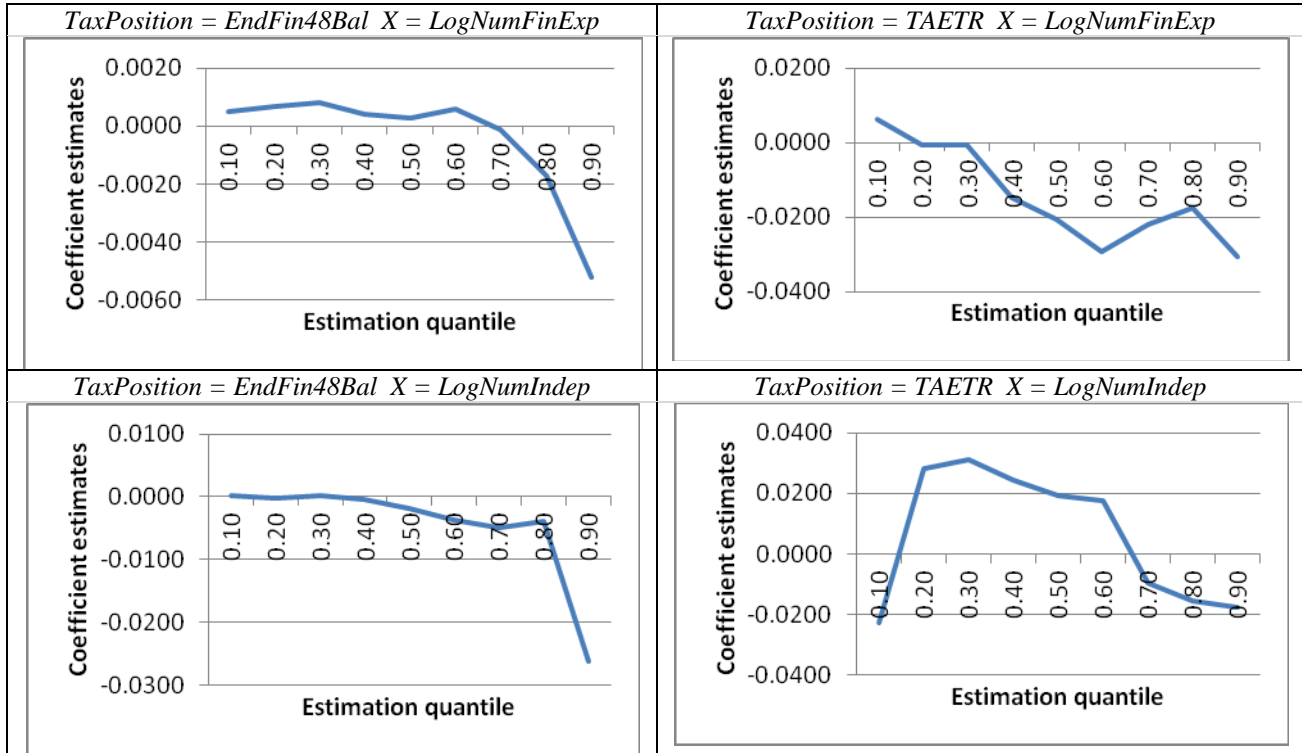




Figure 1

Panel B: Board Expertise and Independence



*EndFin48Bal* is measured as the firm's ending balance of the uncertain tax benefit account (Compustat TXTUBEND), scaled by the firm's average assets over the period. *TAETR* is computed as the mean three-year GAAP *ETR* (computed as the firm's total tax expense scaled by pre-tax income) of the firm's size and industry peers minus the firm's three-year GAAP *ETR*. Size peers are firms within the same quintile of total assets and industry peers are firms within the same Fama-French 48 industry portfolios. *LogNumIndep* is the natural logarithm of one plus the number of independent directors sitting on the board in the year preceding the fiscal year (as indicated by Equilar). *LogNumFinExp* is the natural logarithm of one plus the number of financial experts designated on the board of directors in the year preceding the fiscal year (as indicated by either The Corporate Library or RiskMetrics). *CEOPortDelta* (*CEOPortVega*) is the (risk-neutral) dollar change in the firm CEO's equity portfolio value for a 1% change in the value (volatility) of the firm's stock price (Core and Guay, 2002). *LogCEOPortDelta* (*LogCEOPortVega*) is the natural logarithm of *CEOPortDelta* (*CEOPortVega*).

**Table 3**  
**Desai and Dharmapala (2006) Quantile Regression**

**Table 4 (All Firms)**

	<i>StkMixGrant</i>		<i>WellGov</i>		<i>StkMixGrant * WellGov</i>	
	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat	Coef.	<i>t</i> -stat
<i>OLS</i>	-0.0086	-1.60	0.0323	0.57	0.0016	0.18
<u><i>Quantile</i></u>						
<i>0.05</i>	0.0025	1.50	0.0081	0.01	0.0046	1.11
<i>0.10</i>	0.0025	0.86	0.0081	0.01	0.0046	0.76
<i>0.15</i>	0.0029	0.82	0.0102	0.01	0.0012	0.15
<i>0.20</i>	0.0022	0.56	0.0081	0.01	0.0009	0.11
<i>0.25</i>	0.0020	0.50	0.0090	0.03	-0.0007	-0.09
<i>0.30</i>	0.0012	0.34	0.0175	0.13	-0.0023	-0.27
<i>0.35</i>	0.0006	0.16	0.0186	0.29	-0.0035	-0.50
<i>0.40</i>	0.0000	0.01	0.0064	0.12	-0.0039	-0.47
<i>0.45</i>	-0.0002	-0.07	0.0044	0.09	-0.0038	-0.51
<i>0.50</i>	-0.0004	-0.11	0.0016	0.04	-0.0032	-0.45
<i>0.55</i>	0.0007	0.24	-0.0004	-0.01	-0.0041	-0.60
<i>0.60</i>	0.0011	0.36	0.0079	0.18	-0.0028	-0.41
<i>0.65</i>	0.0014	0.35	0.0086	0.15	-0.0040	-0.52
<i>0.70</i>	0.0015	0.39	0.0048	0.04	-0.0044	-0.63
<i>0.75</i>	0.0023	0.53	0.0065	0.02	-0.0065	-0.84
<i>0.80</i>	0.0022	0.53	0.0059	0.01	-0.0077	-0.80
<i>0.85</i>	0.0014	0.46	0.0211	0.02	-0.0109	-1.65
<i>0.90</i>	-0.0006	-0.24	0.0253	0.02	-0.0080	-1.52
<i>0.95</i>	-0.0006	-0.47	0.0262	0.02	-0.0079	-2.65

Replication of Desai and Dharmapala (2006) Table 4, Column (4) using quantile regression estimation. The following equation is estimated (equation 17 from Desai and Dharmapala, 2006, adjusted to include a mean effect for *WellGov*):

$$\begin{aligned}
 TS_{i,t} = & \beta_0 + \beta_1 STKMIXGRANT_{i,t} + \beta_2 (WELLGOV_i * STKMIXGRANT_{i,t}) \\
 & + \text{Other Interaction Terms} + \text{Firm Fixed Effects} \\
 & + \text{Year Dummies} + \text{Controls} + v_{i,t}.
 \end{aligned}
 \tag{17}$$

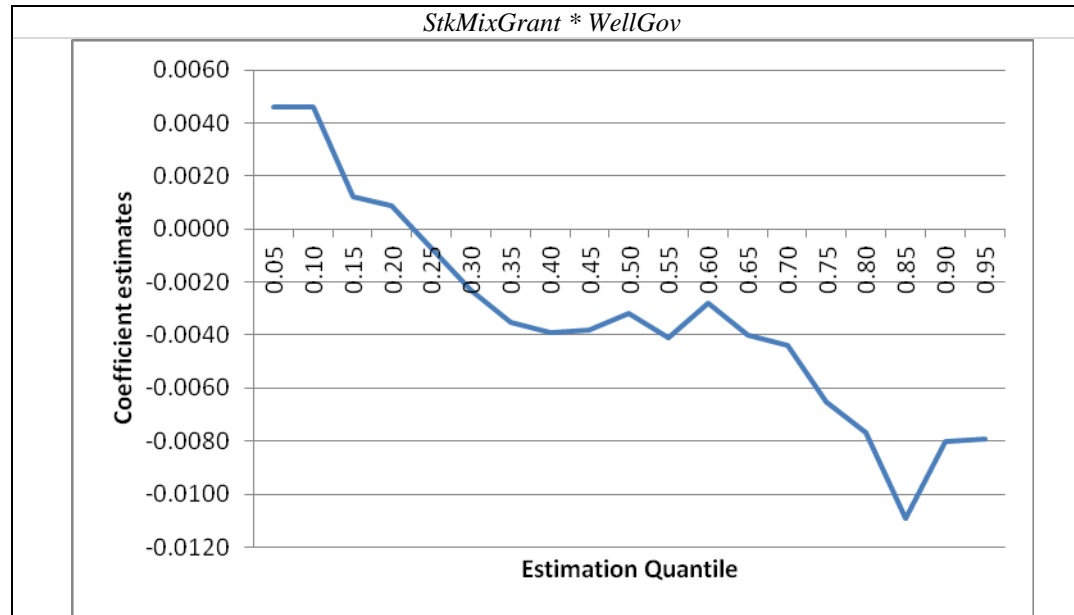
*TS* is the residual estimated from regressing the difference between book and tax income on total accruals (see Desai and Dharmapala, 2006 discussion, p. 159-160). *StkMixGrant* is the ratio of stock option grant value to total compensation for the firm's top five executives. *WellGov* is a dichotomous variable that equals one for firms that have a low governance

index score (G less than or equal to 7) and equals zero otherwise. Estimation includes controlling for the level of deferred taxes and year, firm, and firm-year size fixed effects.

**Figure 2**

**Desai and Dharmapala (2006) Quantile Regression**

**Table 4 (All Firms)**



Coefficient plot for *StkMixGrant \* WellGov* from quantile regression estimation of Desai and Dharmapala (2006) Table 4, Column (4). The following equation is estimated (Desai and Dharmapala, 2006, adjusted to include a mean effect for *WellGov*):

$$TS_{i,t} = \beta_0 + \beta_1 STKMIXGRANT_{i,t} + \beta_2 (WELLGOV_i * STKMIXGRANT_{i,t}) + \text{Other Interaction Terms} + \text{Firm Fixed Effects} + \text{Year Dummies} + \text{Controls} + v_{i,t} \quad (17)$$

*TS* is the residual estimated from regressing the difference between book and tax income on total accruals (see Desai and Dharmapala, 2006 discussion, p. 159-160). *StkMixGrant* is the ratio of stock option grant value to total compensation for the firm's top five executives. *WellGov* is a dichotomous variable that equals one for firms that have a low governance index score (G less than or equal to 7) and equals zero otherwise. Estimation includes controlling for the level of deferred taxes and year, firm, and firm-year size fixed effects.