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Are Female CFOs Less Tax Aggressive? Evidence from Tax Aggressiveness

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ABSTRACT: This paper investigates the effect of CFO gender on corporate tax aggressiveness. Focusing on firms that experience a male-to-female CFO transition, the paper compares those firms' degree of tax aggressiveness during the pre- and post-transition periods. Using the probability of tax sheltering, the predicted unrecognized tax benefits, and the discretionary permanent book-tax differences to measure tax aggressiveness, we find that female CFOs are associated with less tax aggressiveness as compared to their male counterparts. The main findings are supported by additional tests based on propensity score matching, difference-in-differences tests, and tests with a female-to-male CFO transition sample. Overall, our study establishes CFO gender as an important determinant of tax aggressiveness.

Keywords: tax aggressiveness; tax avoidance; gender; CFO; risk aversion.

JEL Classifications: H26; M41; J16.

INTRODUCTION

This paper examines the impact of CFO gender on corporate tax aggressiveness.[1] Prior studies find that substantial variations in the level of firms' tax avoidance exist (e.g., Dyreng, Hanlon, and Maydew 2008). Researchers identify a wide range of firm characteristics and executive compensation incentives as determinants of tax avoidance.[2]

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[1] Hanlon and Heitzman (2010) view tax avoidance as a continuum of tax planning strategies that range from perfectly legal real transactions at one end (e.g., investments in tax-favored assets, such as municipal bonds) to aggressive tax-avoidance practices (e.g., tax shelters) at the other end. Following their definition, we refer to tax aggressiveness as the aggressive end of tax-avoidance practices. We use the term "tax aggressiveness" and "aggressive tax avoidance" interchangeably throughout the paper.

[2] Examples include Gupta and Newberry (1997), Phillips (2003), Rego (2003), Desai and Dharmapala (2006), Wilson (2009), Rego and Wilson (2012), and Lisowsky, Robinson, and Schmidt (2013).

However, many determinants of this variation remain unclear (Weisbach 2002; Hanlon and Heitzman 2010). Dyreng, Hanlon, and Maydew (2010) find that managerial fixed effects have significant explanatory power for firms' tax avoidance. We extend this line of research and examine whether there are systematic differences in the choice of tax aggressiveness between female and male executives. Specifically, we examine whether female CFOs are associated with less tax aggressiveness as compared to their male counterparts.[3]

The gender differences in risk-taking behaviors have been explored extensively in both the psychology and economics literature. Extant studies suggest that women in the general population are more risk averse than men. For instance, women tend to have less risky assets in their investment portfolios (e.g., Jianakoplos and Bernasek 1998; Sundén and Surette 1998; Bernasek and Shwiff 2001) and are more likely to maintain compliance with rules and regulations (e.g., Brinig 1995). However, the evidence is more mixed among professional management personnel. Some studies find that female executives are associated with less earnings management (Barua, Davidson, Rama, and Thiruvadi 2010), more conservative accounting (Francis, Hasan, Park, and Wu 2014), and less risky financing and investment decisions (Huang and Kisgen 2013). Others argue that women who are more risk tolerant self-select into the managerial professions; thus, their risk preferences are not different from those of their male counterparts (e.g., Atkinson, Baird, and Frye 2003; Kumar 2010).

Tax aggressiveness refers to the most extreme subset of tax-avoidance activities that, according to Hanlon and Heitzman (2010, 137), are "pushing the envelope of tax law." Aggressive tax positions are under scrutiny from auditors and tax authorities. When successfully challenged, firms may be subject to large penalties and negative publicity (Lisowsky 2009; Wilson 2009). Firms suspected of tax aggressiveness may bear political costs (Mills, Nutter, and Schwab 2013) and be labeled as "poor corporate citizens" (Hanlon and Slemrod 2009). In responding to a survey by Graham, Hanlon, Shevlin, and Shroff (2014), 69 percent of tax executives agree that potential harm to their firms' reputations is very important when deciding what tax planning strategies to implement. Since tax aggressiveness is more likely to reflect risk attitudes of top executives than are more certain tax-avoidance activities, tax aggressiveness provides us a good setting to examine gender differences in risk taking for managerial professions.

Empirical studies on gender issues often face the criticism that the observed differences are not attributable to gender, but instead to some omitted factors, such as situational factors and knowledge disparities (e.g., Dwyer, Gilkeson, and List 2002; Atkinson et al. 2003). To mitigate this concern, we adopt a methodology similar to that used by Francis et al. (2013) and Huang and Kisgen (2013), which allows CFO gender effect to be idiosyncratic. We construct a sample of 974 firm-year observations with 92 cases of male-to-female CFO transitions. We then examine whether there is a significant difference in tax aggressiveness between the pre- and post-transition periods that can be attributed to a change in CFO gender.

Following Frank, Lynch, and Rego (2009), Rego and Wilson (2012), and Boone, Khurana, and Raman (2013), we use three measures to capture tax aggressiveness. The first measure is the probability of tax sheltering based on Wilson (2009), the second measure is the predicted unrecognized tax benefits following the prediction model in Cazier, Rego, Tian, and Wilson (2009) and Rego and Wilson (2012), and the third measure is the discretionary permanent book-tax differences as defined by Frank et al. (2009). For all three measures of tax aggressiveness, we find a significant decrease in the level of tax aggressiveness subsequent to a

[3] We attempted to examine the CEO gender effect. However, given that there are only 14 male-to-female CEO changes in our sample, our sample size is too small to conduct a meaningful test.

male-to-female CFO transition. The results are consistent with our conjecture that female CFOs are less tax aggressive than their male counterparts. The results are also economically meaningful. For example, we find that the probability of tax sheltering for firms under the control of female CFOs is about 17.4 percent lower than that for firms under the control of male CFOs.

Female CFOs, however, may not be randomly chosen when they are hired. In addition, unobservable time series changes contemporaneous with CFO changes could also affect tax aggressiveness. To mitigate endogeneity concerns, we run three additional tests. First, we use a difference-in-differences research design, in which we use male-to-female CFO transitions as the treatment group and male-to-male CFO transitions as the control group. Second, we use a one-to-one propensity score matching approach to construct a matching sample (firms with male CFOs) and then compare the degree of tax aggressiveness between the treatment sample (firms with female CFOs) and the matching sample (firms with male CFOs). Third, we construct a sample of female-to-male CFO transitions and find that tax aggressiveness increases after firms change their CFOs from female to male. Results from all three tests are consistent with our hypothesis and triangulate our findings from the baseline regressions.

We argue that female CFOs' risk aversion is the underlying reason behind the gender effect on tax aggressiveness. If this is the case, then one should expect the identified relation between female CFOs and tax aggressiveness to vary with the different levels of risk that female CFOs face. To test this conjecture, we bisect the full sample into firms with high and low job security risk. We find that the impact of female CFOs on tax aggressiveness only exists when they face high job security risk. The result is consistent with risk aversion of female CFOs being a channel through which gender affects tax aggressiveness.

Recent studies suggest that overconfidence by male CFOs could also make females' choices seem conservative (e.g., Barber and Odean 2001; Huang and Kisgen 2013). To examine whether our results are driven by risk aversion of female CFOs or overconfidence of male CFOs, we conduct two sets of tests.[4] First, we control for overconfidence and the interaction between overconfidence and gender effect. We find that male-to-female CFO transitions are associated with a reduced level of tax aggressiveness regardless of whether CFOs are overconfident. Second, if risk aversion of female CFOs makes firms miss valuable tax-saving opportunities, then good corporate governance should mitigate the documented gender effect. Indeed, we find some evidence that female CFOs' conservatism in tax strategy is diminished in firms with good corporate governance. Overall, the results suggest that risk aversion of female CFOs is likely an important reason behind the documented gender effect on tax aggressiveness.

To our knowledge, our paper is the first study to document the effect of executive gender on tax aggressiveness. Dyreng et al. (2010) find executive fixed effects on broad tax avoidance but fail to find a gender effect. In contrast, we focus on tax aggressiveness, which is more likely to be affected by the risk preferences of top executives and, hence, provides a stronger test setting.[5] Additionally, we use a methodology that allows us to better isolate the gender effect. Our study provides insight into the role that executives' risk preferences play in the development of a firm's tax strategy. It responds to Hanlon and Heitzman's (2010) call for more research on the impacts of individual top executives on corporate tax strategies.

Broadly, our paper is also part of an emerging literature on the gender effects in corporate decision making. For instance, Barua et al. (2010) find that firms with female CFOs have higher

[4] We thank a referee for suggesting the additional tests and broadening the scope of our study.

[5] As a robustness test (see Table 9), we also examine a potential gender effect on broad tax avoidance in our sample. Similar to Dyreng et al. (2010), we find no evidence of a gender effect whether we measure tax avoidance by the GAAP effective tax rate, the cash effective tax rate, or the total book-tax differences.

financial reporting quality. Huang and Kisgen (2013) find that female executives are less likely to make acquisitions and issue debt, and when they make acquisitions the announcement returns are higher compared to those made by firms with male executives. In this paper, we link the risk aversion of female executives with firm tax aggressiveness and provide evidence that complements and extends the above line of research. Our evidence suggests that although female CFOs engage in broad tax avoidance similar to their male counterparts, they pursue aggressive tax strategies to a lesser extent, probably to avoid additional risk.

The remainder of our paper is structured as follows. We first briefly review the relevant research and present our hypothesis. Next, we describe our sample selection process and present descriptive statistics. Multivariate tests are conducted in the following section. The final section summarizes and concludes.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Tax Aggressiveness and Risk

Taxes represent a significant cost to a company. Tax savings typically increase after-tax earnings, cash flows, and shareholder wealth. For example, Desai and Dharmapala (2009) find a positive relation between tax avoidance and firm value for well-governed firms. It is not surprising that firms actively engage in activities that aim to reduce taxes. Rego and Wilson (2012) provide empirical evidence that firms give managers compensation incentives to engage in aggressive tax avoidance. Phillips (2003) finds that compensating business unit managers based on after-tax performance measures leads to lower effective tax rates.

If there are few costs associated with avoiding taxes, then all firms should minimize corporate tax payments. However, corporate tax payments vary widely across industries and across firms in the same industry. The question of why so many firms forgo tax-avoidance opportunities has been called the "under-sheltering puzzle" (Weisbach 2002; Desai and Dharmapala 2006; Hanlon and Heitzman 2010). This phenomenon suggests that there must be non-trivial costs in avoiding taxes. Some examples include implementation cost, potential penalties imposed by the taxing authorities, and potential reputation damage to firms and their managers (e.g., S. Chen, X. Chen, Cheng, and Shevlin 2010; Rego and Wilson 2012; Graham et al. 2014). For more aggressive tax avoidance, the uncertainty involved can be particularly high.

The most direct risk involved in aggressive tax avoidance is challenges from tax authorities and—for publicly traded firms, such as in our sample—auditors and the Securities and Exchange Commission (SEC). Because aggressive tax positions are normally supported by a relatively weak set of facts, they are more likely to be successfully challenged (Rego and Wilson 2012). To the extent that tax aggressiveness is deemed by tax authorities to be noncompliance, it may be subject to large penalties (Lisowsky 2009). In his sample of tax-shelter firms, Wilson (2009) estimates that the penalty can be as high as 40 percent of the original tax savings from the tax-shelter transactions.

Moreover, if a firm is suspected of being tax aggressive, then the firm may bear reputational costs. The popular press often casts a negative light on firms with aggressive tax positions. For instance, National Public Radio (NPR 2011) disclosed that firms such as Pfizer, Microsoft, and Google were taking advantage of offshore tax havens. These firms were accused of engaging in "corporate tax dodging" and not paying their fair share. Moreover, Mills et al. (2013) find that federal contractors that are highly sensitive to political costs have higher effective tax rates, consistent with aggressive tax avoidance imposing political costs on firms. More recently, Austin and Wilson (2013) argue that another reason firms refrain from aggressive tax avoidance is the concern of loss of reputation with customers. They find some evidence that firms with valuable

brand names have higher effective tax rates.[6] In fact, among tax executives participating in the Graham et al. (2014) survey, 69 percent of executives agree that potential harm to their firms' reputation is an important consideration when choosing their tax strategies.

Gender Differences in Risk Attitudes

Gender differences in attitudes toward risk and in risk-related behavior have long been studied in the psychology and economics literatures. Most studies support the notion that women are more risk averse than men in the general population.[7] Croson and Gneezy (2009) summarize three possible explanations for the gender difference in risk-taking behaviors. First, women are more likely to experience intense nervousness and fear than men in an uncertain situation. Second, women are less confident than men, which may affect the perception of the probability distribution underlying a risk. Finally, women tend to view risky situations as threats rather than challenges, which also lead to increased risk aversion.

A large body of literature on gender differences in the general population addresses financial investment choices. For instance, Jianakoplos and Bernasek (1998) find that single women have less risky assets in their investment portfolios than other groups. Using different survey data, Sundén and Surette (1998) and Bernasek and Shwiff (2001) draw a similar conclusion: women invest their pension assets more conservatively than men do. Moreover, women are more likely to be in compliance with rules and regulations. For example, Brinig (1995) finds that women are less willing to risk being caught and convicted of speeding than men.

Gender differences in risk attitudes among professionals are less well established. Some studies suggest that female executives make more conservative corporate decisions. For instance, Barua et al. (2010) find that firms with female CFOs have lower absolute discretionary accruals and lower absolute accrual estimation errors. Francis et al. (2014) find that female CFOs make more conservative financial reporting. Huang and Kisgen (2013) find that female executives are less likely to make significant acquisitions and issue debt. Olsen and Cox (2001) find that female professional investors are more concerned about downside risk than their male counterparts. Francis, Hasan, and Wu (2013) find that firms with female CFOs are associated with lower cost of debt. Furthermore, Sexton and Bowman-Upton (1990) find that female entrepreneurs are less willing to be involved in uncertain situations.

Other researchers argue that gender differences among professionals are smaller than in the general population and are often nonexistent. For instance, focusing on female CFOs' impact on financial reporting, Ge, Matsumoto, and Zhang (2011) find no evidence of CFO gender effect on discretionary accruals. Atkinson et al. (2003) compare the performance and investment behavior of male and female fixed-income mutual fund managers. They find that the ways in which men and women manage funds do not differ significantly in terms of performance, risk, and other fund characteristics. Using archival data and lab results, Dwyer et al. (2002) and Gysler, Brown-Kruse, and Schubert (2002) draw similar conclusions. Kumar (2010) argues that women with high risk tolerance and superior forecasting abilities tend to self-select into the professional manager profession. He finds that female analysts issue bolder and more accurate forecasts, and that stock market participants respond more strongly to the forecast revisions by female analysts.

[6] A recent study by Gallemore, Maydew, and Thornock (2014) did not find evidence of reputational cost in 118 confirmed sheltering cases in terms of long-run stock performance, CEO and CFO turnover, or public media reputation, etc. The authors acknowledge that the small sample might lack power or that "only firms that are immune to reputational concerns engage in tax shelters" (Gallemore et al. 2014, 3). Graham et al. (2014) also point out that the executives' reputation concerns are difficult to test using archival data.

[7] Eckel and Grossman (2004) and Croson and Gneezy (2009) provide excellent surveys of gender differences in risk attitudes in the economics literature, and a summary of studies on gender differences in the psychology literature can be found in Byrnes, Miller, and Schafer (1999).

To summarize, the literature has mixed views on gender differences in risk attitudes among professionals. Corporate CFOs have the responsibility of deciding and monitoring tax reporting and tax-related financial reporting, and they should be aware of the significant uncertainty involved in the aggressive tax strategies. If female CFOs indeed have higher degrees of risk aversion, then we expect that firms with female CFOs are more cautious with aggressive tax-avoidance activities. In contrast, if female CFOs self-select into the profession and have comparable risk attitudes as their male counterparts, then there should be no gender effect in tax aggressiveness. Our hypothesis, stated as the alternative, is as follows:

H: Female CFOs are less likely to be associated with tax aggressiveness compared to male CFOs.

SAMPLE AND RESEARCH DESIGN

Sample Selection

To examine the gender effect on tax aggressiveness, our primary research design is to compare the degrees of tax aggressiveness between the pre- and post-transition periods for male-to-female CFO turnover firms. Similar to Francis et al. (2014) and Huang and Kisgen (2013), we collect gender information from the ExecuComp database, which covers most of the S&P 1500 public companies. In cases where there is missing gender information in ExecuComp, we manually search the 10-K filing of the firms through the SEC Edgar database. If the company filing does not report the gender of the CFOs, then we further search the company's website and other business websites (such as Forbes.com, Yahoo.com, Google.com, and ZoomInfo.com) to identify the gender of the executives. We construct our CFO transition sample using the following filters: (1) both pre- and post-transition CFOs must be in office consecutively for at least three years excluding the transition year; (2) if a firm changes its CFOs more than once, then we only count the first change and drop the subsequent changes for that firm; (3) we exclude financial firms and utility companies (SIC codes between 6000 and 6999 and between 4900 and 4999), and our time period is from 1988 to 2007.[8] The resulting sample is then merged with Compustat to obtain firm accounting information.[9] Our final sample consists of 974 firm-year observations with 92 cases of male-to-female transitions. For the other two types of transitions that we examine, we have 4,239 firm-year observations with 353 cases of male-to-male transitions, and 421 firm-year observations with 48 cases of female-to-male transitions.

Tax Aggressiveness Measures

Hanlon and Heitzman (2010, 137) state that "if tax avoidance represents a continuum of tax planning strategies where something like municipal bond investments are at one end, then terms such as 'noncompliance,' 'evasion,' 'aggressiveness,' and 'sheltering' would be closer to the other end of the continuum." As our interest is in tax strategies that involve the most uncertainty, we focus on the aggressive end of the continuum. Following Frank et al. (2009), Rego and Wilson (2012), and Boone et al. (2013), we use three measures to capture tax aggressiveness. Our first measure is the probability of tax sheltering based on Wilson (2009). *SHELTER* is a dummy variable, which equals 1 if a firm's estimated sheltering probability is in the top quintile, and 0 otherwise. Our second measure is the

[8] As a robustness check, we rerun the tests for the period after 1994 (i.e., after SFAS No. 109 became effective). The unreported results remain qualitatively the same.

[9] Firms with zero or negative taxable income are assumed to have attenuated incentives to engage in tax-sheltering activity. We follow the prior literature (e.g., Desai and Dharmapala 2006) and include only firm-years with positive tax expense (TXFED).

predicted unrecognized tax benefits (*PREDICTED UTB*) calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012). Our third measure is the discretionary permanent book-tax differences (*DTAX*) introduced by Frank et al. (2009).

Using actual sheltering cases, Wilson (2009) develops a model to predict the likelihood that a firm engages in tax-sheltering activities. Recent studies find that Wilson's (2009) sheltering probabilities have construct validity. For instance, researchers show that the sheltering probabilities are associated with the stock price crash risk (Kim, Li, and Zhang 2011), the sensitivity of a manager's wealth to stock return volatility (Rego and Wilson 2012), and irresponsible corporate social activities (Hoi, Wu, and Zhang 2013). Following Rego and Wilson (2012) and Hoi et al. (2013), we capture the risky tax positions by focusing on firms with top quintile values of estimated sheltering probability.

Unrecognized tax benefits represent the amount of income taxes associated with uncertain tax positions. Recent studies find that the UTB level is positively associated with aggressive tax avoidance. For example, using confidential tax-shelter data from the Office of Tax Shelter Analysis, Lisowsky et al. (2013) find that the UTB level is highly and positively associated with tax-shelter activities.

FASB Interpretation No. 48 (FIN 48, FASB 2006) was enacted in June 2006 and became effective for all publicly listed companies with the fiscal year beginning after December 15, 2006. It represents a drastic change in the disclosure of the tax reserve for uncertain tax positions. Prior to FIN 48, companies used varied methods to estimate UTB, which led to UTB disclosures that were not necessarily comparable across firms.[10] In addition, the lack of a clear standard also resulted in scant and opaque UTB disclosures prior to FIN 48 (Gleason and Mills 2002; Blouin, Gleason, Mills, and Sikes 2010). Because our sample period ends in 2007, we do not have actual UTB information for our sample firms. Following Cazier et al. (2009), Rego and Wilson (2012), and Boone et al. (2013), we estimate the predicted UTB level based on the estimated coefficients from the prediction model in Rego and Wilson (2012).

As *SHELTER* and *PREDICTED UTB* are both linear combinations of a set of firm characteristics, it is possible that our results are attributable to changes in firm characteristics rather than changes in tax aggressiveness. To alleviate this concern, we use *DTAX* as the third measure of tax aggressiveness. *DTAX* was established by Frank et al. (2009) and has become increasingly used as a proxy for tax aggressiveness in the accounting literature (e.g., Rego and Wilson 2012; Hasan, Hoi, Wu, and Zhang 2014; Lisowsky et al. 2013). Frank et al. (2009) argue that book-tax differences have both a temporary and a permanent component. They find that it is the discretionary permanent component of book-tax differences—*DTAX*—that is significantly related to actual cases of tax sheltering. Appendix A provides detailed information about how we construct these three measures of tax aggressiveness.

Research Design and Summary Statistics

Following Chen et al. (2010) and Hoi et al. (2013), we use the following multiple regression model to test our hypothesis:

$$\begin{aligned} TAX\_AGG_{i,t} = {} & \beta_0 + \beta_1 POST_{i,t} + \beta_2 ROA_{i,t} + \beta_3 LEVERAGE_{i,t} + \beta_4 NOL_{i,t} + \beta_5 \Delta NOL_{i,t} \\ & + \beta_6 PPE_{i,t} + \beta_7 INTANG_{i,t} + \beta_8 EQINC_{i,t} + \beta_9 SIZE_{i,t} + \beta_{10} MB_{i,t} \\ & + \beta_{11} CFO\text{-}VEGA_{i,t} + \text{ Industry Dummies} + \text{Year Dummies} + \varepsilon_{i,t}; \end{aligned} \quad (1)$$

where $TAX\_AGG_{i,t}$ represents the three tax aggressiveness measures for firm i in year t. $POST_{i,t}$

[10] Methods used by firms prior to FIN 48 were offered in SFAS No. 109, *Accounting for Income Taxes* (FASB 1992), now ASC No. 740, and SFAS No. 5, *Accounting for Contingencies* (FASB 1975), now ASC No. 450. According to the FIN 48 Summary, SFAS No. 109 "contains no specific guidance on how to address uncertainty in accounting for income tax assets and liabilities. As a result, diverse accounting practices have developed resulting in inconsistency in the criteria used to recognize, derecognize, and measure benefits related to income taxes. The diversity in practice (regarding uncertain tax positions) has resulted in noncomparability in reporting income tax assets and liabilities."

captures CFO gender effect on tax aggressiveness and is an indicator variable that equals 1 if a firm-year is after a (male-to-female) CFO transition, and 0 if a firm-year is before a CFO transition.

More profitable firms could have higher incentives for tax planning (Chen et al. 2010), thus we control for $ROA_{i,t}$. $ROA_{i,t}$ is the return on assets for firm i in year t measured as operating income (PI − XI) scaled by lagged assets (AT). More leveraged firms are less likely to engage in aggressive tax planning because of the tax benefits of debt financing (e.g., Graham and Tucker 2006). We include $LEVERAGE_{i,t}$ in the regressions. $LEVERAGE_{i,t}$ is leverage for firm i in year t calculated as long-term debt (DLTT) scaled by lagged assets (AT). We use $NOL_{i,t}$ and $\Delta NOL_{i,t}$ to capture whether firms use the tax benefits associated with loss carry forwards. $NOL_{i,t}$ is a dummy variable coded as 1 if loss carry forward (TLCF) for firm i is positive as of the beginning of the year t, and 0 otherwise; $\Delta NOL_{i,t}$ is the change in loss carry forward (TLCF) for firm i in year t scaled by lagged assets (AT). Capital-intensive firms are more affected by the different treatments of depreciation expenses for tax and financial reporting purposes, so we include $PPE_{i,t}$, which is calculated as property, plant, and equipment (PPENT) for firm i in year t scaled by lagged assets (AT). We include $EQINC_{i,t}$ and $INTANG_{i,t}$ to control for the differential book and tax treatments of intangible assets and consolidated earnings accounted for using the equity method. $INTANG_{i,t}$ is the intangible assets (INTAN) for firm i in year t scaled by lagged assets (AT); $EQINC_{i,t}$ is the equity income in earnings for firm i in year t scaled by lagged assets (AT). We also control for firm size ($SIZE_{i,t}$) and growth opportunities ($MB_{i,t}$) because larger firms exhibit more tax avoidance due to economies of scale and firm complexity, and high growth firms have more investments that generate increased tax avoidance (e.g., Boone et al. 2013). $SIZE_{i,t}$ is the natural logarithm of total assets (AT) for firm i at the beginning of year t; $MB_{i,t}$ is the market-to-book ratio measured as market value of equity scaled by the book value of equity for firm i at the beginning of year t. Next, we control for $CFO\text{-}VEGA_{i,t}$ because Rego and Wilson (2012) show that tax avoidance increases as CEOs' risk-taking incentives increase. $CFO\text{-}VEGA_{i,t}$ is the sensitivity of the change in the Black–Scholes option value for a 1 percent change in stock return volatility multiplied by the number of options in the CFO's portfolio for firm i in year t. Finally, we include dummy variables to control for year and industry fixed effects.

Table 1 reports sample statistics of the male-to-female CFO transition sample. The sample size for the three tax aggressiveness measures varies due to data requirements in the estimation procedures. We find that the mean value of *TAX SHELTERING PROBABILITY* is 0.571, the mean value of *PREDICTED UTB* is 0.010, and the mean value of *DTAX* is 0.020. These values are similar to those reported in Kim et al. (2011), Rego and Wilson (2012), and Hasan et al. (2014). Table 1 also shows that the average value of *ROA* is 0.052, the mean value of *LEVERAGE* is 0.223, the average *PPE* is 0.324, and the mean *INTANG* is 0.167. Approximately 25 percent of the observations have a *NOL*. The mean *MB* is 1.829, and the mean *CFO-VEGA* is 47.019.

EMPIRICAL RESULTS

Baseline Regression Results

Table 2 presents Logit and OLS regression results on how the transitions from male CFOs to female CFOs affect tax aggressiveness.

In Table 2, Column (1), we report the results of estimating Equation (1) using *SHELTER* as the dependent variable. The coefficient on *POST* is −0.875 and is statistically significant at the 5 percent level. The coefficient of −0.875 translates into a marginal effect of −0.174 in the Logit regression, indicating that the probability of tax sheltering is 17.4 percent lower in the post-transition period (under the control of female CFOs) than in the pre-transition period (under the

TABLE 1

Summary Statistics

	Obs.	Mean	Std. Dev.	P25	Median	P75
TAX SHELTERING PROBABILITY	658	0.571	0.201	0.490	0.612	0.711
PREDICTED UTB	798	0.010	0.010	0.006	0.010	0.015
DTAX	608	0.020	0.098	−0.017	0.004	0.040
ROA	1013	0.052	0.153	0.016	0.052	0.096
LEVERAGE	998	0.223	0.179	0.087	0.215	0.327
NOL	1005	0.251	0.434	0.000	0.000	1.000
ΔNOL	1001	0.025	0.273	0.000	0.000	1.000
PPE	978	0.324	0.275	0.128	0.248	0.455
INTANG	848	0.167	0.233	0.011	0.078	0.253
EQINC	726	0.001	0.009	0.000	0.000	0.000
SIZE	1004	7.347	1.737	6.257	7.194	8.422
MB	979	1.829	1.405	0.857	1.504	2.346
CFO-VEGA ($000s)	650	47.019	73.121	8.772	30.803	52.154

Variable Definitions:
TAX SHELTERING PROBABILITY = calculated based on Wilson (2009);
PREDICTED UTB = predicted unrecognized tax benefits calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012);
DTAX = discretionary permanent book-tax difference in Frank et al. (2009);
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by AT;
NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);
EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);
SIZE = natural logarithm of total assets at the beginning of the year;
MB = market-to-book ratio; and
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio.

control of male CFOs).[11] Thus, the result is economically meaningful and it is consistent with our hypothesis and suggests that female CFOs are less likely to be involved in tax-shelter behaviors as compared to their male counterparts.

In Column (2), we report the results of estimating Equation (1) using *PREDICTED UTB* as the dependent variable. The coefficient on *POST* is −0.002 and is significant at the 5 percent level, indicating that the predicted UTB level in the post-transition period is 0.002 lower than that in the pre-transition period. Given that the mean value of *PREDICTED UTB* is 0.010, the result is economically meaningful and is comparable to other studies.[12] Again, the result is consistent with our hypothesis and shows that female CFOs are associated with a lower level of uncertain tax positions than their male counterparts.

[11] For comparison, Boone et al. (2013) find a coefficient of −0.55 on Catholic counties when they use the same dependent variable in their regression model.

[12] For comparison purpose, Boone et al. (2013) find that the *PREDICTED UTB* level for firms headquartered in more religious counties is about 0.001 to 0.002 lower than that for firms headquartered in less religious counties.

TABLE 2

Baseline Regressions

	Predicted Signs	(1) Logit *SHELTER*	(2) OLS *PREDICTED UTB*	(3) OLS *DTAX*
POST	−	−0.875**	−0.002**	−0.021*
		(−2.31)	(−2.45)	(−1.79)
ROA	+	18.930***	0.022***	0.080
		(4.98)	(5.74)	(1.12)
LEVERAGE	−	−0.746	0.008***	−0.012
		(−0.53)	(3.27)	(−0.31)
NOL	+	2.456***	0.001	0.029**
		(4.70)	(1.14)	(2.02)
ΔNOL	+	−0.954	−0.001	0.005
		(−1.33)	(−0.38)	(0.24)
PPE	+	−0.927	−0.012***	0.012
		(−1.06)	(−6.90)	(0.43)
INTANG	+	0.661	−0.007***	0.078***
		(0.69)	(−4.01)	(2.93)
EQINC	+	−18.535	−0.014	0.184
		(−0.80)	(−0.35)	(0.28)
SIZE	+	0.644***	0.001***	0.010*
		(3.78)	(3.54)	(1.96)
MB	+	0.253	0.000	0.000
		(1.35)	(0.15)	(0.09)
CFO-VEGA	+	0.001	0.001**	0.001
		(0.07)	(2.46)	(0.84)
Industry and year effects		Yes	Yes	Yes
Observations		247	358	240
Pseudo/Adjusted R^2		0.327	0.296	0.209

*, **, *** Significance at the 10 percent, 5 percent, and 1 percent levels, respectively.
Heteroscedasticity robust t-statistics or z-statistics are in parentheses.
The sample includes 92 S&P 1500 firms that change their CFOs from male to female in the 1988–2007 period. Year and industry dummies are included in each specification.

Variable Definitions:
SHELTER = a dummy variable that equals 1 if a firm's estimated tax sheltering probability is in the top quintile of tax sheltering probabilities, and 0 otherwise;
TAX SHELTERING PROBABILITY = calculated based on Wilson (2009);
PREDICTED UTB = predicted unrecognized tax benefits calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012);
DTAX = discretionary permanent book-tax difference in Frank et al. (2009);
POST = a dummy variable that equals 1 if a year is after CFO transition year, and 0 if a year is before CFO transition year;
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by lagged assets (AT);
NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);
EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);

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TABLE 2 (continued)

SIZE = natural logarithm of total assets at the beginning of the year;
MB = market-to-book ratio; and
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio.

In Column (3), we report the results of estimating Equation (1) using *DTAX* as the third measure of tax aggressiveness. The coefficient on *POST* is −0.021 and is significant at the 10 percent level, indicating that, on average, the discretionary permanent book-tax differences are significantly lower for firms under the control of female CFOs than for firms under the control of male CFOs. The result is also consistent with our hypothesis and triangulates the findings from the other two measures of tax aggressiveness.

Sensitivity Tests

Difference-in-Differences Regression Results

Unobservable time series changes contemporaneous with CFO changes could also affect tax aggressiveness, which could make our results spurious. To remove the effect of contemporaneous changes on our results, we employ a difference-in-differences methodology. Following Francis et al. (2014) and Huang and Kisgen (2013), we first construct a control sample of firms that change their CFOs from male to male. We then pool the treatment sample (i.e., firms that switch from male CFOs to female CFOs) and the control sample.[13] We create a dummy variable *FEMALE* that equals 1 if a firm is a male-to-female CFO transition firm, and 0 if a firm is a male-to-male CFO transition firm. We add an interaction term *POST* ∗ *FEMALE* into the Equation (1) using the pooled sample. Again *POST* is coded as 1 if a year is after a CFO transition, and 0 if a year is before a CFO transition. If female CFOs are less tax aggressive than male CFOs, then we expect the coefficient on the interaction variable to be significantly negative.

Results from these regressions are reported in Table 3. Column (1) of Table 3 reports estimation results when we use *SHELTER* as the dependent variable. The coefficient on *POST* is 0.448 and is significant at the 5 percent level, suggesting that the tax-sheltering probability increases after male-to-male CFO changes. Furthermore, the interaction term *POST* ∗ *FEMALE* has a coefficient of −1.371 and is significant at the 1 percent level. This result indicates that after male-to-female CFO changes, the tax-sheltering probability decreases. The evidence is consistent with female CFOs being associated with lower probability of tax sheltering than their male counterparts, providing further support to the baseline regression results.

In Column (2), we use *PREDICTED UTB* as the dependent variable. We find that the coefficient on *POST* is statistically insignificant. Again, the interaction term *POST* ∗ *FEMALE* has a negative coefficient and is significant at the 5 percent level, suggesting that firms in the post male-to-female CFO transition period are associated with lower uncertainty tax positions as compared to firms in the post male-to-male transition period. In Column (3), we draw similar inferences when we use *DTAX* as the measure of tax aggressiveness. Specifically, the coefficient on *POST* is insignificant, but the coefficient on the interaction term *POST* ∗ *FEMALE* is negative and statistically significant.

[13] We compared major firm characteristics between the control and treatment firms. We do not find significant differences between the two samples except for the market-to-book ratio (i.e., firms switching to female CFOs have a slightly higher market-to-book ratio than firms switching to male CFOs). For brevity, we do not tabulate the results.

TABLE 3

Difference-in-Differences Regressions

	Predicted Signs	(1) Logit *SHELTER*	(2) OLS *PREDICTED UTB*	(3) OLS *DTAX*
POST	?	0.448**	0.000	0.008
		(2.23)	(0.34)	(0.86)
*POST * FEMALE*	−	−1.371***	−0.002**	−0.019*
		(−4.83)	(−2.51)	(−1.74)
ROA	+	6.690***	0.010***	0.054
		(7.09)	(5.36)	(1.62)
LEVERAGE	−	−1.769***	−0.002	−0.017
		(−3.17)	(−1.57)	(−0.65)
NOL	+	1.633***	0.000	0.014
		(7.09)	(1.00)	(1.37)
ΔNOL	+	−0.164	0.000	0.006
		(−0.50)	(0.20)	(0.39)
PPE	+	−0.811**	−0.009***	−0.032*
		(−2.07)	(−8.99)	(−1.69)
INTANG	+	−0.046	−0.003***	0.088***
		(−0.11)	(−2.76)	(4.83)
EQINC	+	10.174	0.031	0.208
		(1.07)	(1.41)	(0.54)
SIZE	+	1.208***	0.001**	0.006**
		(12.60)	(2.33)	(2.03)
MB	+	0.118	0.000	0.005
		(1.44)	(0.33)	(1.54)
CFO-VEGA	+	0.006**	0.001***	0.000
		(2.10)	(2.69)	(0.55)
Industry and year effects		Yes	Yes	Yes
Observations		1,098	1,525	994
Pseudo/Adjusted R^2		0.368	0.114	0.086

*, **, *** Significance at the 10 percent, 5 percent, and 1 percent levels, respectively.
Heteroscedasticity robust t-statistics or z-statistics are in parentheses.
The sample includes 92 S&P 1500 firms that change their CFOs from males to females, and 353 S&P 1500 firms that change their CFOs from males to males in the 1988–2007 period. Year and industry dummies are included in each specification.

Variable Definitions:
SHELTER = a dummy variable that equals 1 if a firm's estimated tax sheltering probability is in the top quintile of tax sheltering probabilities, and 0 otherwise;
TAX SHELTERING PROBABILITY = calculated based on Wilson (2009);
PREDICTED UTB = predicted unrecognized tax benefits calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012);
DTAX = discretionary permanent book-tax difference in Frank et al. (2009);
POST = a dummy variable that equals 1 if a year is after CFO transition year, and 0 if a year is before CFO transition year;
FEMALE = a dummy variable that equals 1 if a firm is a male-to-female transition firm, and 0 if a firm is a male-to-male transition firm;
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by lagged assets (AT);

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TABLE 3 (continued)

NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);
EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);
SIZE = natural logarithm of total assets at the beginning of the year;
MB = market-to-book ratio; and
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio.

In sum, the findings of the difference-in-differences approach suggest that the decreases in tax aggressiveness following the male-to-female transitions are less likely to be attributed to unobservable contemporaneous time-series changes. They provide further support for our hypothesis that female CFOs are less likely to be associated with tax aggressiveness.

Propensity Score Matching Results

Another concern is self-selection bias. It could be the case that female CFOs are not randomly assigned to firms. To address this potential selection bias issue, we apply a propensity score matching approach. We first construct the treatment sample using variables in the ExecuComp database. We collect all firm-year level CFO information and then create a dummy variable *FEMALE CFO* that equals 1 if a CFO is female, and 0 otherwise. Then we match this treatment female CFO sample with the male CFO sample. The matching begins with a Logit regression of the *FEMALE CFO* dummy variable on the major firm characteristics, board characteristics, and CFO personal characteristics. Specifically, the independent variables include *ROA, LEVERAGE, NOL, SIZE, MB, CFO AGE, CFO SHAREHOLDING* (the percentage of common shares holdings by CFOs), *INSIDER* (a dummy variable that equals 1 if a CFO is hired from inside the firm, and 0 otherwise), *BOARD SIZE* (total number of board members), *BOARD INDEPENDENCE* (the ratio of number of outside directors to board size), and *BOARD DUALITY* (a dummy variable that equals 1 if a CEO is also the chairman of the board, and 0 otherwise).

In Panel A of Table 4, we report the results on the determinants of female CFOs. We find that firms with a higher market-to-book ratio and larger boards are more likely to choose female CFOs, and that female CFOs are more likely to be promoted from within the firm than hired from outside. Furthermore, firms with dual boards are less likely to choose a female CFO, and the average female CFO is younger than her male counterparts.

Next, we use the propensity scores obtained from the Logit estimations and perform a one-to-one nearest neighbor match. To ensure that the treatment sample and the matching sample are not significantly different in terms of major firm characteristics, we use the caliper-matching method and match within a caliper of 10 percent, where caliper refers to the difference in the predicted probabilities between the treatment and matching firms. This procedure ensures that each male-to-female CFO transition firm is paired with a male-to-male CFO transition firm with similar firm characteristics. After matching, our final sample includes 296 treatment sample observations and 296 control sample observations.

Panel B of Table 4 provides summary statistics of variables that are used in the matching process for both treatment and control samples, as well as the differences in mean and t-test results. Because we use the caliper-matching method, our matched control sample does not systematically differ from our treatment sample.

TABLE 4

Propensity Score Matching Regressions

Panel A: Logit Regression of the Choice of Female CFOs

	Predicted Signs	*FEMALE CFO*
ROA	?	−0.097
		(−0.24)
LEVERAGE	−	−0.077
		(−0.27)
NOL	−	−0.189
		(−1.28)
SIZE	−	−0.007
		(−0.21)
MB	+	0.239***
		(5.21)
CFO AGE	−	−0.076***
		(−3.93)
CFO SHAREHOLDING	?	−0.000
		(−0.53)
INSIDER	+	0.873***
		(4.28)
BOARD SIZE	+	0.073**
		(2.31)
BOARD INDEPENDENCE	+	0.283
		(0.63)
BOARD DUALITY	−	−0.312*
		(−1.78)
Industry and year effects		Yes
Observations		1,843
Pseudo R^2		0.121

Panel B: Comparison between Treatment Sample and Control Sample

	Control Sample (Firms with Male CFOs)		Treatment Sample (Firms with Female CFOs)			
	Obs.	**Mean**	**Obs.**	**Mean**	**Difference**	**t-statistics**
ROA	296	0.0373	296	0.0477	−0.0104	−0.9069
LEVERAGE	296	0.2099	296	0.2075	0.0024	0.1516
NOL	296	0.1864	296	0.2152	−0.0288	−0.8481
SIZE	296	7.6077	296	7.5988	0.0090	0.0623
MB	296	1.7667	296	1.9178	−0.1512	−1.2619
CFO AGE	296	58.9459	296	58.9381	0.0078	0.0322
CFO SHAREHOLDING	296	0.0574	296	0.0717	−0.0143	−0.6874
INSIDER	296	0.3850	296	0.4120	−0.0270	−0.7658
BOARD SIZE	296	9.8571	296	9.7365	0.1206	0.7576
BOARD INDEPENDENCE	296	0.7068	296	0.7005	0.0063	0.5519
BOARD DUALITY	296	0.8539	296	0.8571	−0.0032	−0.1132

(continued on next page)

TABLE 4 (continued)

Panel C: Propensity Score Matching Regressions Results

	Predicted Signs	(1) Logit *SHELTER*	(2) OLS *PREDICTED UTB*	(3) OLS *DTAX*
FEMALE CFO	−	−0.816**	−0.002**	−0.021*
		(−2.10)	(−1.97)	(−1.71)
ROA	+	7.616***	0.008***	0.054
		(3.47)	(2.63)	(0.76)
LEVERAGE	−	−3.263***	−0.001	0.053
		(−2.64)	(−0.27)	(1.32)
NOL	+	2.319***	0.001	0.029*
		(4.37)	(0.91)	(1.95)
ΔNOL	+	−1.211	0.001	−0.025
		(−1.61)	(0.35)	(−1.04)
PPE	+	−0.735	−0.006**	0.002
		(−0.89)	(−2.55)	(0.06)
INTANG	+	−0.066	−0.003	0.025
		(−0.07)	(−1.14)	(0.78)
EQINC	+	1.297	−0.029	−0.099
		(0.07)	(−0.53)	(−0.24)
SIZE	+	0.802***	0.000	−0.002
		(5.40)	(1.02)	(−0.38)
MB	+	0.120	0.000	−0.000
		(0.81)	(0.46)	(−0.09)
CFO-VEGA	+	0.006*	0.000	0.000
		(1.69)	(0.81)	(0.22)
Industry and year effects		Yes	Yes	Yes
Observations		256	344	215
Pseudo/Adjusted R^2		0.325	0.096	0.154

*, **, *** Significance at the 10 percent, 5 percent, and 1 percent levels, respectively.
Heteroscedasticity robust t-statistics or z-statistics are in parentheses.
Panel A reports Logit regression results on the choice of female CFOs. Panel B reports the univariate comparison between treatment sample (firms with female CFOs) and control sample (firms with male CFOs) that are used in propensity score matching regressions. Panel C reports propensity score matching regressions results. The treatment sample includes 296 observations with female CFOs, and the control sample includes 296 observations with male CFOs. Year and industry dummies are included in each specification.

Variable Definitions:
SHELTER = a dummy variable that equals 1 if a firm's estimated tax sheltering probability is in the top quintile of tax sheltering probabilities, and 0 otherwise;
TAX SHELTERING PROBABILITY = calculated based on Wilson (2009);
PREDICTED UTB = predicted unrecognized tax benefits calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012);
DTAX = discretionary permanent book-tax difference in Frank et al. (2009);
FEMALE CFO = a dummy variable that equals 1 if a CFO is a female, and 0 otherwise;
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by lagged assets (AT);
NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);

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TABLE 4 (continued)

EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);
SIZE = natural logarithm of total assets at the beginning of the year;
MB = market-to-book ratio;
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio;
CFO AGE = age of the CFO;
PREVIOUS CFO = a dummy variable that equals 1 if a CFO has previous CFO experience, and 0 otherwise;
CFO SHAREHOLDING = percentage of common shares holding by CFOs; and
INSIDER = a dummy variable that equals 1 if a CFO is hired from inside of the firm, and 0 otherwise.

Panel C of Table 4 reports the results from propensity score matching regression. As before, we use *SHELTER, PREDICTED UTB,* and *DTAX* as the measures of tax aggressiveness in Columns (1), (2), and (3), respectively. We find that the three coefficients on *FEMALE CFO* are all negative and statistically significant, indicating that female CFOs are less tax aggressive than male CFOs in the matched sample. Thus, the results using the propensity score matching approach mitigate the concern with self-selection bias and further support our hypothesis.

Female-to-Male CFO Transitions and Tax Aggressiveness

To the extent that the significant decrease in the level of tax aggressiveness following a male-to-female CFO transition is due to the different risk preferences of female and male CFOs, we would expect the degree of tax aggressiveness to increase after firms change from female CFOs to male CFOs. To examine if this is the case, we construct a sample of female-to-male CFO transitions using the same criteria as the male-to-female CFO transitions sample. Our final sample includes 48 female-to-male CFO changes.

Table 5 presents regression results using the female-to-male CFO transitions sample. In the regression, *POST* is a dummy variable that equals 1 if a year is after the female-to-male CFO transition year, and 0 if a year is before the transition year. We find that all three coefficients on *POST* are positive and that two out of three are significant at the 10 percent level. In general, our results suggest that firms become more tax aggressive after a female-to-male CFO transition. The additional evidence is consistent with our hypothesis and it triangulates our findings from the male-to-female transitions sample.

Other Sensitivity Tests

We further conduct several sensitivity tests. To mitigate the effects of unobservable within-firm factors on tax aggressiveness, we conduct Logit and OLS regressions with standard errors adjusted for within-firm clustering. The results are reported in Panel A of Table 6. For brevity, we only report results for our main testing variable *POST*. We find that *POST* is still statistically significant after adjusting standard errors for within-firm clustering. This is true whether we measure tax aggressiveness using *SHELTER, PREDICTED UTB,* or *DTAX*.

The CFO gender effects on tax aggressiveness could be different for CFOs with different tenures. In our sample, CFO tenure ranges from three to 11 years. For a more sensible comparison, we create a subsample by keeping the time period between year $t-3$ and year $t+3$. The results are shown in Panel B of Table 6. With this alternative sample, the three coefficients on *POST* are still negative and statistically significant, providing support to the results in our baseline regressions.

We control for several additional variables to see whether our results are sensitive to additional controls. The additional controls include *CFO AGE, PREVIOUS CFO* (a dummy variable that equals 1 if a CFO has previous CFO experience, and 0 otherwise), *CFO SHAREHOLDING,*

TABLE 5

Female-to-Male CFO Changes

	Predicted Signs	(1) Logit *SHELTER*	(2) OLS *PREDICTED UTB*	(3) OLS *DTAX*
POST	+	1.220*	0.005*	0.020
		(1.86)	(1.67)	(1.26)
ROA	+	1.539	0.012**	0.719***
		(1.05)	(2.20)	(6.05)
LEVERAGE	−	−2.919*	−0.012*	0.142
		(−1.67)	(−1.85)	(1.55)
NOL	+	−1.184	−0.001	0.075
		(−1.45)	(−0.31)	(1.02)
ΔNOL	+	0.441	0.004	−0.000
		(0.50)	(1.35)	(−0.01)
PPE	+	0.572	0.003	−0.350**
		(0.41)	(0.53)	(−2.22)
INTANG	+	−7.314***	−0.011*	−0.193*
		(−3.15)	(−1.78)	(−1.77)
EQINC	+	6.276	0.036	−0.217
		(0.71)	(0.18)	(−0.09)
SIZE	+	0.627*	0.002*	0.002
		(1.83)	(1.77)	(0.07)
MB	+	−0.168	0.003**	0.005
		(−0.46)	(2.48)	(0.19)
CFO-VEGA	+	0.017	0.001	0.001
		(1.10)	(0.25)	(1.21)
Industry and year effects		Yes	Yes	Yes
Observations		139	142	63
Pseudo/Adjusted R^2		0.404	0.128	0.437

*, **, *** Significance at the 10 percent, 5 percent, and 1 percent levels, respectively.
Heteroscedasticity robust t-statistics or z-statistics are in parentheses.
The sample includes 48 S&P 1500 firms that change their CFOs from female to male in the 1988–2007 period. Year and industry dummies are included in each specification.

Variable Definitions:
SHELTER = a dummy variable that equals 1 if a firm's estimated tax sheltering probability is in the top quintile of tax sheltering probabilities, and 0 otherwise;
TAX SHELTERING PROBABILITY = calculated based on Wilson (2009);
PREDICTED UTB = predicted unrecognized tax benefits calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012);
DTAX = discretionary permanent book-tax difference in Frank et al. (2009);
POST = a dummy variable that equals 1 if a year is after CFO transition year, and 0 if a year is before CFO transition year;
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by lagged assets (AT);
NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);
EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);
SIZE = natural logarithm of total assets at the beginning of the year;

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TABLE 5 (continued)

MB = market-to-book ratio; and
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio.

INSIDER, FOREIGN INCOME (foreign income scaled by lagged assets), *G-INDEX* (Gompers, Ishii, and Metrick [2003] corporate governance index), and *CONCURRENT CEO CHANGE* (a dummy variable that equals 1 if there is also a CEO change during the CFO transition year, and 0 otherwise). The results are reported in Panel C of Table 6. We find that our main results continue to hold after controlling for these CFO personal characteristics and corporate governance attributes.

The Risk Effect on the Relation between Female CFOs and Tax Aggressiveness

So far our results provide evidence that female CFOs are less likely to be associated with tax aggressiveness than male CFOs. If female CFOs' risk aversion is the underlying reason, then we should observe even more conservative tax strategies when female CFOs are subject to higher job risk. Desai, Hogan, and Wilkins (2006) and Hennes, Leone, and Miller (2008) find that managerial turnover rate is higher following the revelation of aggressive accounting. In addition, they find that displaced managers are less likely to find comparable employment subsequent to the displacement. Thus, if female CFOs are concerned about maintaining their positions at the top managerial level, then they could be particularly conservative in their tax positions.

To test this conjecture, we construct a job risk measure. Using ExecuComp information, we first calculate the turnover rate of each firm. It is defined as the total number of top managers being fired in the industry scaled by the total number of firms in the industry. We then construct a dummy variable *JOB RISK* that equals 1 if a firm's turnover rate is above the median value of the turnover rate, and 0 otherwise. We bisect the full sample into *HIGH JOB RISK* firms and *LOW JOB RISK* firms. We rerun Equation (1) with the two subsamples and report the results in Table 7. We find that the coefficients on *POST* are only significant for firms with high job risk, not for firms with low job risk. This is true regardless of which of the three measures of tax aggressiveness are used as the dependent variable. Overall, the findings indicate that female CFOs are less tax aggressive than males only when they have bigger concerns with their job security. The results are consistent with risk aversion being a channel through which CFO gender affects tax aggressiveness.

Are Results Driven by Overconfidence of Male CFOs?

In this paper, we argue that female CFOs are less associated with tax aggressiveness than male CFOs as a result of risk aversion. Some recent studies argue that the overconfidence of male executives could also drive their aggressive corporate decisions (e.g., Huang and Kisgen 2013). Although both overconfidence of males and risk aversion of females predict less tax aggressiveness for female CFOs, the implications of these two stories are different. If our results are due to female CFOs' lower degree of overconfidence, then one could view lower levels of tax aggressiveness by female CFOs as helping firms engage in appropriate tax planning. If, on the other hand, the results are due to female CFOs' higher degree of risk aversion, one could argue that female CFOs do not pursue all available tax-saving opportunities for firms.

To test whether our results are driven by overconfidence of male CFOs or risk aversion of female CFOs, we conduct two sets of tests. First, we include the overconfidence dummy and the interaction between the overconfidence dummy and *POST* as additional controls in Equation (1). The coefficient on *POST* would capture how male-to-female CFO changes affect tax aggressiveness within the subsample of CFOs who are not overconfident, and the coefficient on the interaction term

TABLE 6

Other Sensitivity Tests

Panel A: Firm Clustering

	Predicted Signs	(1) Logit *SHELTER*	(2) OLS *PREDICTED UTB*	(3) OLS *DTAX*
POST	−	−0.875**	−0.002**	−0.021*
		(−2.54)	(−1.99)	(−1.88)
All other controls		Yes	Yes	Yes
Industry and year effects		Yes	Yes	Yes
Observations		247	358	240
Pseudo/Adjusted R^2		0.327	0.296	0.209

Panel B: Three Years Before and After CFO Transitions

	Predicted Signs	(1) Logit *SHELTER*	(2) OLS *PREDICTED UTB*	(3) OLS *DTAX*
POST	−	−1.131**	−0.002**	−0.022*
		(−2.03)	(−2.20)	(−1.75)
All other controls		Yes	Yes	Yes
Industry and year effects		Yes	Yes	Yes
Observations		158	246	169
Pseudo/Adjusted R^2		0.396	0.291	0.221

Panel C: Additional Controls

	Predicted Signs	(1) Logit *SHELTER*	(2) OLS *PREDICTED UTB*	(3) OLS *DTAX*
POST	−	−1.481**	−0.002**	−0.049**
		(−2.21)	(−2.01)	(−2.05)
CFO AGE	−	−0.002	0.000	0.002
		(−0.02)	(0.64)	(0.61)
PREVIOUS CFO	?	0.540	−0.001	−0.001
		(0.63)	(−0.58)	(−0.04)
CFO SHAREHOLDING	+	0.010**	0.000	−0.000
		(2.46)	(0.63)	(−0.61)
INSIDER	+	0.898	0.001	0.044
		(0.83)	(0.52)	(1.04)
FI	+	17.701**	0.046***	0.509*
		(2.19)	(2.99)	(1.88)
G-INDEX	−	−0.272*	0.000	0.000
		(−1.76)	(0.06)	(0.06)
CONCURRENT CEO CHANGE	?	−1.100	0.002	0.026
		(−1.30)	(1.62)	(0.77)
All other controls		Yes	Yes	Yes
Industry and year effects		Yes	Yes	Yes

(continued on next page)

TABLE 6 (continued)

	Predicted Signs	(1) Logit *SHELTER*	(2) OLS *PREDICTED UTB*	(3) OLS *DTAX*
Observations		105	154	108
Pseudo/Adjusted R^2		0.486	0.317	0.233

*, **, *** Significance at the 10 percent, 5 percent, and 1 percent levels, respectively.
Heteroscedasticity robust t-statistics or z-statistics are in parentheses.
The sample includes 92 S&P 1500 firms that change their CFOs from male to female in the 1988–2007 period. Panel A provides Logit and OLS regression results with clustered standard errors at the firm level. In Panel B, we restrict our sample period within three years before and three years after male-to-female CFO transitions. In Panel C, we add several new control variables. Year and industry dummies are included in each specification.

Variable Definitions:
SHELTER = a dummy variable that equals 1 if a firm's estimated tax sheltering probability is in the top quintile of tax sheltering probabilities, and 0 otherwise;
TAX SHELTERING PROBABILITY = calculated based on Wilson (2009);
PREDICTED UTB = predicted unrecognized tax benefits calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012);
DTAX = discretionary permanent book-tax difference in Frank et al. (2009);
POST = a dummy variable that equals 1 if a year is after CFO transition year, and 0 if a year is before CFO transition year;
CFO AGE = age of the CFO;
PREVIOUS CFO = a dummy variable that equals 1 if a CFO has previous CFO experience, and 0 otherwise;
CFO SHAREHOLDING = percentage of common shares holding by CFOs;
INSIDER = a dummy variable that equals 1 if a CFO is hired from inside of the firm, and 0 otherwise;
FI = foreign income (PIFO) scaled by lagged assets;
G-INDEX = Gompers et al. (2003) corporate governance index;
CONCURRENT CEO CHANGE = a dummy variable that equals 1 if there is also a CEO change during CFO transition year, and 0 otherwise. All other controls include following variables:
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by lagged assets (AT);
NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);
EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);
SIZE = natural logarithm of total assets at the beginning of the year;
MB = market-to-book ratio;
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio.

captures the incremental effect of overconfident male-to-female CFO changes on tax aggressiveness.

Following Ahmed and Duellman (2013), we use three proxies to measure overconfidence. *HOLDER67* is a dummy variable that equals 1 if the ratio of stock options in-the-money exceeds 0.67 at least twice during the sample period, and 0 otherwise. *OVER-INVEST* is a dummy variable that equals 1 if the residual from a regression of total assets growth on sales growth run by industry-year is greater than 0, and 0 otherwise. *OVER-CAPX* is a dummy variable that equals 1 if capital expenditures deflated by lagged total assets is greater than the median in the firm's Fama-French industry, and 0 otherwise.

Second, if firms miss valuable tax-saving opportunities due to the risk aversion of female CFOs, then good corporate governance should mitigate lower degrees of tax aggressiveness under

TABLE 7

Subsample Tests

	(1) Logit *HIGH JOB RISK SHELTER*	(2) Logit *LOW JOB RISK SHELTER*	(3) OLS *HIGH JOB RISK PREDICTED UTB*	(4) OLS *LOW JOB RISK PREDICTED UTB*	(5) OLS *HIGH JOB RISK DTAX*	(6) OLS *LOW JOB RISK DTAX*
POST	−4.880***	−0.097	−0.004**	−0.001	−0.035**	0.023
	(−2.81)	(−0.19)	(−2.37)	(−0.89)	(−2.35)	(0.90)
ROA	37.040**	20.541***	0.031***	0.010*	0.113	0.292*
	(2.13)	(3.96)	(4.68)	(1.94)	(1.31)	(1.77)
LEVERAGE	−3.476	1.955	0.016***	0.004*	0.023	−0.018
	(−0.66)	(1.08)	(2.95)	(1.78)	(0.51)	(−0.15)
NOL	5.023**	2.487***	−0.002	0.003***	0.035*	0.004
	(2.04)	(3.54)	(−1.03)	(2.90)	(1.90)	(0.12)
ΔNOL	−4.437	−0.782	0.001	−0.002	0.006	0.023
	(−1.64)	(−0.80)	(0.27)	(−1.09)	(0.23)	(0.48)
PPE	−4.995	−1.621	−0.011**	−0.010***	−0.039	0.080
	(−1.19)	(−1.34)	(−2.61)	(−5.80)	(−1.18)	(1.22)
INTANG	−8.071	1.141	−0.004	−0.005***	0.025	0.212***
	(−1.38)	(0.97)	(−0.85)	(−2.80)	(0.74)	(3.16)
EQINC	69.852	−32.901	0.069	0.036	0.255	−0.442
	(0.44)	(−1.23)	(0.52)	(0.94)	(0.38)	(−0.14)
SIZE	0.964*	0.580**	0.001	0.001***	0.010	0.001
	(1.88)	(2.46)	(1.47)	(2.70)	(1.44)	(0.11)
MB	−0.722	0.325	0.000	0.000	0.001	0.002
	(−1.00)	(1.37)	(0.12)	(0.86)	(0.21)	(0.19)
CFO-VEGA	0.024	0.001	0.001**	0.000	0.001*	0.000
	(1.30)	(0.22)	(2.02)	(0.77)	(1.69)	(0.48)
Industry and year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	116	120	175	181	117	121
Pseudo/Adjusted R^2	0.408	0.351	0.348	0.294	0.293	0.198

*, **, *** Significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

(continued on next page)

TABLE 7 (continued)

Heteroscedasticity robust t-statistics or z-statistics are in parentheses.
The sample includes 92 S&P 1500 firms that change their CFOs from male to female in the 1988–2007 period. We separate the sample into two subsamples based on top executive job risk. Year and industry dummies are included in each specification.

Variable Definitions:
JOB RISK = a dummy variable that equals 1 if a firm's turnover rate is above the median value of the sample's turnover rate. Turnover rate is defined as the total number of top managers being fired in the industry scaled by the industry size;
SHELTER = a dummy variable that equals 1 if a firm's estimated tax sheltering probability is in the top quintile of tax sheltering probabilities, and 0 otherwise;
TAX SHELTERING PROBABILITY = calculated based on Wilson (2009);
PREDICTED UTB = predicted unrecognized tax benefits calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012);
DTAX = discretionary permanent book-tax difference in Frank et al. (2009);
POST = a dummy variable that equals 1 if a year is after CFO transition year, and 0 if a year is before CFO transition year;
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by lagged assets (AT);
NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);
EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);
SIZE = natural logarithm of total assets at the beginning of the year;
MB = market-to-book ratio; and
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio.

female CFOs. We use two measures of good governance. The first one is *LOW G-INDEX,* which is a dummy variable that equals 1 if a firm's G-index is below the median value of G-index for the sample, and 0 otherwise. Using institutional ownership to measure good governance, Desai and Dharmapala (2009) find that tax aggressiveness increases firm value when firms have good corporate governance. Following their study, we use *HIGH INSTITUTIONAL OWNERSHIP* as our second measure of good governance. It is a dummy variable that equals 1 if a firm's institutional ownership is above the median value of the institutional ownership for the sample, and 0 otherwise. We interact *POST* with the two good governance metrics, separately. We expect the interaction terms to have positive coefficients if risk aversion of female CFOs is the main underlying story.

In Panel A of Table 8, we report the results when we add the three overconfidence indicator variables and their interactions with *POST* in Equation (1). Our results show that *POST* carries negative signs in all nine regressions and is negative and statistically significant in seven of them. This suggests that in the subsample of CFOs who are not overconfident, a male-to-female transition is still associated with a reduced level of tax aggressiveness. In addition, eight out of nine coefficients on the interaction terms are insignificant, indicating that the gender effect in tax aggressiveness is not significantly different between overconfident CFOs and CFOs who are not overconfident. Overall, the evidence suggests that overconfidence is unlikely to solely explain our results. Female CFOs' higher degree of risk aversion is at least one important underlying reason for our findings.

In Panel B of Table 8, we report the results when we add the two variables that proxy for good governance and their interactions with *POST*. When *SHELTER* is the dependent variable (Models (1) and (2)), *POST* continues to be negative and statistically significant. The interaction of *LOW G-INDEX* and *POST* is positive and significant at the 10 percent level. There is some evidence that the female CFOs' conservatism in tax planning is diminished for firms with good corporate governance. In Models (3) and (4), *PREDICTED UTB* is the dependent variable. Again, *POST* remains negative and significant. The interaction of *HIGH INSTITUTIONAL OWNERSHIP* and *POST* is positive and significant at the 10 percent level. Once more, the evidence is consistent with good corporate governance mitigating the gender effect on tax aggressiveness. In Models (5) and (6), when we use *DTAX* as the measure of tax aggressiveness, the interaction of *HIGH INSTITUTIONAL OWNERSHIP* and *POST* is positive and significant at the 10 percent level, triangulating the earlier results. Taken together, the test results reported in Table 8, Panel B provide evidence that female CFOs from good-governance firms are associated with less conservative tax strategies than female CFOs from poor-governance firms. Together with evidence in Panel A, the results are consistent with the risk aversion of female CFOs being one important underlying reason for our findings.

Female CFOs and Broad Tax Avoidance

We have thus far provided evidence to support our hypothesis that female CFOs are less tax aggressive than their male counterparts. As Hanlon and Heitzman (2010) point out, tax avoidance is a continuum of tax planning activities that ranges from perfectly legal transactions at one end to aggressive tax-avoidance practices at the other end. In the main text, we focus on tax aggressiveness, i.e., the subset of tax-avoidance activities that involve the most uncertainties, because it provides a relatively strong setting to detect gender effect. Managers could also avoid tax by using tax planning strategies that entail less risk. In this section, we examine whether female CFOs are also less associated with broad tax avoidance compared to male CFOs.

Lisowsky et al. (2013) place effective tax rate (*ETR*), cash effective tax rate (*CETR*), and total book-tax difference (*BT*) toward the mostly legal and less uncertain end of the tax avoidance continuum. Rego and Wilson (2012) also argue that *CETR* diverges farther from the construct of

TABLE 8

Are Results Driven by Overconfidence of Male CFOs?

Panel A: Control for Overconfidence

	Pred. Signs	(1) Logit *SHELTER*	(2) Logit *SHELTER*	(3) Logit *SHELTER*	(4) OLS *PREDICTED UTB*	(5) OLS *PREDICTED UTB*	(6) OLS *PREDICTED UTB*	(7) OLS *DTAX*	(8) OLS *DTAX*	(9) OLS *DTAX*
POST	−	−0.751	−1.306**	−1.557***	−0.004***	−0.002**	−0.002**	−0.029*	−0.019	−0.027*
		(−1.32)	(−2.56)	(−2.65)	(−3.76)	(−2.03)	(−2.06)	(−1.70)	(−1.52)	(−1.69)
HOLDER67	+	0.823			0.004***			0.036**		
		(1.28)			(3.87)			(2.04)		
*POST * HOLDER67*	?	−0.062			0.004***			0.012		
		(−0.08)			(2.90)			(0.48)		
OVER-INVEST	+		0.298			0.002*			0.016	
			(0.49)			(1.86)			(0.94)	
*POST * OVER-INVEST*	?		0.855			0.000			−0.025	
			(1.12)			(0.30)			(−1.00)	
OVER-CAPX	+			0.177			0.001			0.017
				(0.29)			(0.79)			(0.99)
*POST * OVER-CAPX*	?			0.933			0.001			0.014
				(1.17)			(0.50)			(0.56)
All other controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry and year effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations		245	238	237	356	345	343	240	231	229
Pseudo/Adjusted R^2		0.338	0.338	0.351	0.326	0.292	0.283	0.224	0.203	0.212

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TABLE 8 (continued)

Panel B: Interaction with Corporate Governance

	Pred. Signs	(1) Logit *SHELTER*	(2) Logit *SHELTER*	(3) OLS *PREDICTED UTB*	(4) OLS *PREDICTED UTB*	(5) OLS *DTAX*	(6) OLS *DTAX*
POST	−	−1.786***	−1.004*	−0.003**	−0.003***	−0.031*	−0.038**
		(−2.71)	(−1.84)	(−2.39)	(−3.12)	(−1.78)	(−2.30)
LOW G-INDEX	+	0.724		0.001		0.009	
		(1.13)		(1.25)		(0.49)	
*POST * LOW G-INDEX*	?	1.411*		0.002		0.017	
		(1.78)		(1.24)		(0.67)	
HIGH INSTITUTIONAL OWNERSHIP	+		−0.191		−0.002		−0.016
			(−0.29)		(−1.38)		(−0.83)
*POST * HIGH INSTITUTIONAL OWNERSHIP*	?		0.212		0.003*		0.039*
			(0.26)		(1.89)		(1.76)
All other controls		Yes	Yes	Yes	Yes	Yes	Yes
Industry and year effects		Yes	Yes	Yes	Yes	Yes	Yes
Observations		247	241	354	349	237	228
Pseudo/Adjusted R^2		0.350	0.328	0.290	0.295	0.202	0.212

*, **, *** Significance at the 10 percent, 5 percent, and 1 percent levels, respectively.
Heteroscedasticity robust t-statistics or z-statistics are in parentheses.
The sample includes 92 S&P 1500 firms that change their CFOs from male to female in the 1988–2007 period. Panel A provides Logit and OLS regression results with additional controls for three measures of overconfidence and their interaction terms with *POST*. Panel B provides Logit and OLS regression results with additional controls for two measures of good corporate governance and their interaction terms with *POST*. Year and industry dummies are included in each specification.

Variable Definitions:
TAX SHELTERING PROBABILITY = calculated based on Wilson (2009);
PREDICTED UTB = predicted unrecognized tax benefits calculated with the estimated coefficients from the prediction model in Rego and Wilson (2012);
DTAX = discretionary permanent book-tax difference in Frank et al. (2009);
POST = a dummy variable that equals 1 if a year is after CFO transition year, and 0 if a year is before CFO transition year;
HOLDER67 = a dummy variable that equals 1 if the ratio of the options in-the-money exceeds 0.67 at least twice during the sample period, and 0 otherwise. The ratio of the options in-the-money is calculated based on Ahmed and Duellman (2013);
OVER-INVEST = a dummy variable that equals 1 if the residual of a regression of total assets growth on sales growth run by industry-year is greater than 0, and 0 otherwise;
OVER-CAPX = a dummy variable that equals 1 if the capital expenditures deflated by lagged total assets are greater than the median level of capital expenditures to lagged total assets of the firm's Fama-French industry, and 0 otherwise;

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TABLE 8 (continued)

LOW G-INDEX = a dummy variable that equals 1 if a firm's G-index is below the median value of G-index for the sample, and 0 otherwise;
G-INDEX = Gompers et al. (2003) corporate governance index;
HIGH INSTITUTIONAL OWNERSHIP = a dummy variable that equals 1 if a firm's institutional ownership is above the median value of the institutional ownership for the sample, and 0 otherwise;
INSTITUTIONAL OWNERSHIP = fraction of a firm's outstanding shares owned by institutional investors. Other controls include following variables:
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by lagged assets (AT);
NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);
EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);
SIZE = natural logarithm of total assets at the beginning of the year;
MB = market-to-book ratio; and
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio.

aggressive tax avoidance than *SHELTER, PREDICTED UTB,* and *DTAX*—the three tax aggressive metrics in our main test. As a result, we capture broad tax avoidance with *ETR, CETR,* and *BT,* and rerun Equation (1). *ETR* is the ratio of total tax expenses over pretax income. *CETR* is the ratio of cash tax paid over pretax income. *BT* is the Manzon and Plesko (2002) measure of total book-tax differences.

We report the results in Table 9. The coefficients on *POST* are statistically insignificant in all three models. We, thus, find no evidence that female CFOs behave differently compared to their male counterparts in terms of broad tax-avoidance strategies. This is consistent with inferences from Dyreng et al. (2010), who also document no gender effect when measuring tax avoidance with *ETR* and *CETR*. According to Hanlon and Heitzman (2010) and Lisowsky et al. (2013), *ETR* and *CETR* reflect the entire spectrum of a firm's tax-avoidance activities, which includes tax aggressive strategies. Because *ETR* and *CETR* do not solely reflect tax aggressiveness, it is not surprising that we find no differences between male and female CFOs in terms of broad tax avoidance.

CONCLUSION

Tax aggressiveness has become an increasingly prevalent phenomenon in corporate America and has attracted considerable attention from regulators, the financial press, and investors. Extant studies identify a wide range of determinants of tax aggressiveness such as various firm attributes, compensation incentives, and manager fixed effects (e.g., Gupta and Newberry 1997; Phillips 2003; Wilson 2009; Dyreng et al. 2010; Rego and Wilson 2012; Lisowsky et al. 2013). In this paper, we borrow from the psychology and economics literature and link the risk aversion of female CFOs to firms' varying degrees of tax aggressiveness. We employ a methodology that allows us to isolate the gender effect on tax aggressiveness. Specifically, we construct a sample with male-to-female CFO transitions and then examine whether there is a significant decline in tax aggressiveness following the male-to-female CFO transitions. Our findings are threefold. First, female CFOs are less likely to be associated with tax aggressiveness compared to their male counterparts. Second, risk aversion of female CFOs is an important factor—if not the sole reason—behind the gender differences in tax aggressiveness. Finally, we find no evidence that sample female CFOs behave differently from their male counterparts in less-risky tax-avoidance activities.

To our knowledge, our paper is the first study to document executive gender effect on tax aggressiveness. Our study suggests that although female CFOs do not act differently compared to their male counterparts in terms of broad tax avoidance, they pursue aggressive tax strategies to a lesser extent. Our study provides insight into the role that risk preferences of top executives play in the development of a firm's tax strategy. Furthermore, our study answers Hanlon and Heitzman's (2010) call for more research on the influence of managers' individual characteristics on corporate tax decisions.

Our results should be interpreted in light of other studies on the gender effect. In the current literature, female executives appear to serve companies well in several aspects of corporate strategies. For instance, prior studies find that female executives engage less in value-decreasing acquisitions, employ lower levels of debt, and promote better-quality financial reporting (e.g., Barua et al. 2010; Francis et al. 2014; Huang and Kisgen 2013). We complement this line of research by identifying an aspect of decision making by female CFOs that could be costly to firms. Specifically, female CFOs do not pursue all tax-saving opportunities, probably to avoid additional risk. With more and more companies having females in their top management team, it is increasingly important to fully understand potential benefits and costs of having female CFOs.[14]

[14] For example, according to Catalyst (2008), the proportion of female top management team members in Fortune 500 firms has increased from 8.7 percent in 1995 to 15.7 percent in 2007.

TABLE 9

Female CFOs and Broad Tax Avoidance

	Predicted Signs	(1) OLS *ETR*	Predicted Signs	(2) OLS *CETR*	Predicted Signs	(3) OLS *BT*
POST	?	0.013	?	0.028	?	−0.006
		(0.66)		(1.29)		(−0.78)
ROA	−	0.258*	−	0.038	+	0.556***
		(1.75)		(0.23)		(16.02)
LEVERAGE	+	−0.037	+	−0.026	−	0.076***
		(−0.54)		(−0.33)		(3.28)
NOL	−	−0.021	−	−0.067**	+	0.011
		(−0.87)		(−2.47)		(1.16)
ΔNOL	−	0.044	−	0.001	+	0.004
		(1.08)		(0.03)		(0.28)
PPE	−	0.005	−	−0.011	+	−0.027*
		(0.12)		(−0.23)		(−1.76)
INTANG	−	0.082*	−	0.047	+	−0.062***
		(1.71)		(0.78)		(−3.84)
EQINC	−	1.311	−	1.078	+	−1.118***
		(1.30)		(0.97)		(−3.11)
SIZE	−	0.006	−	−0.001	+	0.003
		(0.76)		(−0.07)		(0.95)
MB	−	−0.010	−	0.006	+	−0.001
		(−1.35)		(0.70)		(−0.19)
CFO-VEGA	−	−0.000	−	0.000	+	0.001**
		(−0.54)		(0.42)		(2.17)
Industry and year effects		Yes		Yes		Yes
Observations		342		329		343
Adjusted R^2		0.094		0.116		0.507

*, **, *** Significance at the 10 percent, 5 percent, and 1 percent levels, respectively.
Heteroscedasticity robust t-statistics are in parentheses.
The sample includes 92 S&P 1500 firms that change their CFOs from male to female in the 1988–2007 period. Year and industry dummies are included in each specification.

Variable Definitions:
ETR = total income tax expense (TXT) divided by pre-tax book income (PI) before special items (SPI);
CETR = defined as cash tax paid (TXPD) divided by pre-tax book income (PI) before special items (SPI);
BT = Manzon and Plesko (2002) total book-tax differences;
POST = a dummy variable that equals 1 if a year is after CFO transition year, and 0 if a year is before CFO transition year;
ROA = return on assets measured as operating income (PI − XI) scaled by lagged assets (AT);
LEVERAGE = leverage ratio measured as long-term debt (DLTT) scaled by lagged assets (AT);
NOL = a dummy variable that equals 1 if loss carry forward (TLCF) is positive as of the beginning of the year, and 0 otherwise;
ΔNOL = change in loss carry forward (TLCF) scaled by lagged assets (AT);
PPE = property, plant, and equipment (PPENT) scaled by lagged assets (AT);
INTANG = intangible assets (INTAN) scaled by lagged assets (AT);
EQINC = equity income in earnings (ESUB) scaled by lagged assets (AT);
SIZE = natural logarithm of total assets at the beginning of the year;
MB = market-to-book ratio; and
CFO-VEGA = sensitivity of the change in the Black-Scholes option value for a 1 percent change in stock return volatility, multiplied by the number of options in the CFO's portfolio.

For example, one important question is whether hiring female CFOs enhances overall firm value. We leave this question for future research.

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APPENDIX A

Tax Aggressiveness Variable Definitions

$BT_{i,t}$ = Manzon and Plesko (2002) book-tax difference (BT) for firm i in year t. *BT* is defined as (U.S. domestic financial income − U.S. domestic taxable income − income taxes (State) − income taxes (Other) − equity in earnings)/lagged assets = (PIDOM − TXFED/statutory tax rate − TXS − TXO − ESUB)/AT_{t-1}. Firms with zero or negative taxable income are assumed to have attenuated incentives to engage in tax-sheltering activity. We follow the prior literature, e.g., Desai and Dharmapala (2006), and include only firm-years with positive TXFED.

$SHELTER_{i,t}$ = a dummy variable that equals 1 if the firm's estimated sheltering probability is in the top quintile, and 0 otherwise. The tax-sheltering model is based on Wilson (2009): Sheltering = $-4.86 + 5.20 \times BT + 4.08 \times |DAP| - 1.41 \times LEV + 0.76 \times SIZE + 3.51 \times ROE + 1.72 \times FOREIGN\ INCOME + 2.43 \times R\&D$ where:

- *BT* = defined as above;
- |*DAP*| = the absolute value of discretionary accruals from the performance-adjusted modified cross-sectional Jones (1991) model;
- *LEV* = long-term debt divided by beginning of year total assets;
- *SIZE* = the log of total assets;
- *ROE* = pre-tax return on equity;
- *FOREIGN INCOME* = an indicator variable set equal to 1 for firm observations reporting foreign income, and 0 otherwise; and
- *R&D* = R&D expense divided by lagged total assets.

PREDICTED $UTB_{i,t}$ = predicted unrecognized tax benefits for firm i in year t. *PREDICTED UTB* is calculated based on the estimated coefficient from Rego and Wilson (2012): $PREDICTED\ UTB = -0.004 + 0.011 \times PT\_ROA + 0.001 \times SIZE + 0.01 \times FOR\_SALE + 0.092 \times R\&D + 0.002 \times DISC\_ACCR + 0.003 \times LEV + 0.000 \times MTB + 0.014 \times SG\&A - 0.018 \times SALE\_GR$ where:

PT_ROA = pre-tax return on assets;
SIZE = the log of total assets;
FOR_SALE = the ratio of foreign sales to total assets;
R&D = research and development expense scaled by beginning of year total assets;
DISC_ACCR = discretionary accruals from the performance-adjusted modified cross-sectional Jones (1991) model;
LEV = long-term debt divided by beginning of year total assets;
MTB = market-to-book ratio;
SG&A = selling, general and administrative expenses divided by beginning of year total assets; and
SALE_GR = three-year average sales growth rate.

$DTAX_{i,t}$ = Frank et al. (2009) discretionary permanent book-tax difference for firm *i* in year *t*.
DTAX = the residual from the following regression estimated by two-digit SIC code and fiscal year:

$$PERMDIFF = \beta_0 + \beta_1 INTANG + \beta_2 UNCON + \beta_3 MI + \beta_4 CSTE + \beta_5 \Delta NOL + \beta_6 LAGPERM + \varepsilon;$$

where: $PERMDIFF = BI - ((CFTE + CFOR)/STR) - (DTE/STR)$.

BI = pre-tax book income (PI);
CFTE = current federal tax expense (TXFED);
CFOR = current foreign tax expense (TXFO);
DTE = deferred tax expense (TXDI); *STR* is statutory tax rate;
INTANG = goodwill and other intangibles (INTAN);
UNCON = income (loss) reported under the equity method (ESUB);
MI = income (loss) attributable to minority interest (MII) for firm;
CSTE = current state income tax expense (TXS);
ΔNOL = change in net operating loss carry forwards (TLCF); and
LAGPERM = one-year lagged *PERMDIFF*.

We follow the method in Frank et al. (2009) to handle the missing value problems in estimating $DTAX_{i,t}$. If minority interest (MII), current foreign tax expense (TXFO), income from unconsolidated entities (ESUB), or current state tax expense (TXS) is missing on Compustat, then we set *MI, CFOR, UNCON,* or *CSTE,* respectively, to 0. If current federal tax expense (TXFED) is missing on Compustat, then we set the value of *CFTE* to: total tax expense (TXT) less current foreign tax expense (TXFO) less current state tax expense (TXS) less deferred tax expense (TXDI). If information for goodwill and other intangibles (INTAN) is missing on Compustat, then we set the value for *INTANG* to 0. If *INTANG* = "C," then we set the value of *INTANG* to that for goodwill (GDWL). To run the regression models, we require at least 20 observations for each industry-year.

$ETR_{i,t}$ = the GAAP effective tax rate for firm *i* in year *t*.
ETR = total tax expense (TXT) divided by pretax income, which is measured as the difference between pre-tax book income (PI) before special items (SPI). *ETR* is set as missing when the denominator is 0 or negative. We truncate *ETR* to the range [0, 1].
$CETR_{i,t}$ = the cash effective tax rate for firm *i* in year *t*. *CETR* is defined as cash tax paid (TXPD) divided by pretax income, which is measured as the difference between pre-tax book income (PI) before special items (SPI). *CETR* is set as missing when the denominator is 0 or negative. We truncate *CETR* to the range [0, 1].