Managerial ability and tax aggressiveness

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Abstract

Purpose – The aim of this paper is to examine how managerial ability affects corporate tax aggressiveness.
Design/methodology/approach – The study follows the work of Demerjian, Lev, and McVay (2012) and quantifies managerial ability by calculating how efficiently managers generate revenues from given economic resources using the data envelopment analysis (DEA) approach. The study uses a wide range of measures of tax aggressiveness. Firm fixed-effects regressions and a difference-in-differences approach using information regarding CEO turnover to control for endogeneity are used.
Findings – The study finds a negative relationship between managerial ability and corporate tax aggressiveness. Further tests show that this negative relationship is more pronounced for firms with higher investment opportunities or firms with more reputational concerns.
Originality/value – Given the significant costs associated with tax aggressiveness and the negative effect it can have on managerial reputation if discovered, the results suggest that more able managers invest less effort in aggressive tax avoidance activities. This study furthers the understanding of how managerial personal traits affect corporate decision-making.

Keywords Managerial ability, Tax aggressiveness, Investment opportunities, Reputation costs
Paper type Research paper

1. Introduction

The last two decades have witnessed steady increases in tax avoidance around the world. Accordingly, corporate tax avoidance has received considerable attention from both academics and policy makers. Hanlon and Heitzman (2010, p. 137) note that "clearly, most interest, both for researchers and for tax policy, is in actions at the *aggressive* end of the (tax avoidance) continuum" [1]. An emerging stream of literature examines the determinants of aggressive tax avoidance (e.g. Armstrong, Blouin, & Larcker, 2012; Rego & Wilson, 2012; Chyz, Leung, Li, & Rui, 2013; Hoi, Wu, & Zhang, 2013; McGuire, Wang, & Ryan, 2014; Francis, Hasan, Wu, & Meng, 2014; Allen, Francis, Wu, & Zhao, 2016). However, as Chi, Huang, and Sanchez (2017) point out, most studies focus on firm-level characteristics or corporate governance mechanisms and largely ignore how individual managers impact

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corporate tax aggressiveness. This is surprising given the fact that corporate decisions are made by individual persons, and individual managers' "styles" play a significant role in making strategic and operational decisions (Bertrand & Schoar, 2003) [2].

Dyreng, Hanlon, and Maydew (2010) took an important step in shedding light on this issue by providing evidence that managerial fixed effects are important determinants of firms' tax avoidance. They further find that common individual characteristics such as education, gender and age cannot explain this variation, although they conclude that "the executive effects on tax avoidance appear to be idiosyncratic" (p. 1165). Managerial ability, which captures the dimension of managerial human capital, is exceptionally important for the success of corporations (Francis, Huang, Rajgopal, & Zang, 2008; Shavinina & Medvid, 2009). Prior studies show that managerial ability has a significant impact on various corporate decisions, including investment and accounting decisions (e.g. Rose & Shepard, 1997; Bertrand & Schoar, 2003; Demerjian, Lev, & McVay, 2013; Francis, Ren, Sun, & Wu, 2016; Francis, Hasan, Siraj, & Wu, 2019). Thus, individual managerial abilities could provide a plausible explanation for why managers are important for corporate tax aggressiveness and could help move the literature forward.

It can be argued that a more able manager who is better at generating economic benefits from traditional operations should also be more successful at exploiting all tax avoidance opportunities, including aggressive tax strategies. However, this argument ignores several important factors that could lead to an opposite prediction.

First, although traditional theory views tax avoidance as a value-added activity that transfers wealth from the government to shareholders, aggressive tax strategies may incur costs that would offset potential benefits generated from the strategies. Reputational costs associated with tax aggressiveness would be one of the important factors in determining tax strategies. Anecdotal evidence indicates that managers suffer from loss of reputation and adverse media attention as a result of aggressive tax avoidance activities. For example, GE's former CEO, Jeffrey R. Immelt, has received a lot of criticisms from the media and the public since the revelation of GE's aggressive tax avoidance first surfaced in the New York Times in 2011. The tax literature suggests that reputational concerns limit firms' and managers' willingness to engage in aggressive tax avoidance (e.g. Desai & Dharmapala, 2006; Hanlon & Slemrod, 2009; Chen, Huang, Li, & Stanfield, 2012; Graham, Hanlon, Shevlin, & Shroff, 2014; Austin & Wilson, 2017). For example, the survey conducted by Graham *et al.* (2014) show that 72% (60%) of publicly traded firms' top executives agree that "potential harm to their firms' reputations" ("adverse media attention") is an important factor to consider when deciding which tax planning strategies to implement. Empirically, Dyreng, Hoopes, and Wilde (2016) find that public pressure plays a significant role in deterring public firms' aggressive tax avoidance. Austin and Wilson (2017) find that firms who are more sensitive to reputation losses among consumers tend to engage in less tax avoidance. Furthermore, Chyz and Gaertner (2018) provide evidence that CEOs are more likely to experience forced turnover when their firms' effective tax rates are much lower than the benchmark.

Managerial ability is closely related to managerial reputation (e.g. Fee & Hadlock, 2003; Francis *et al.*, 2008; Doukas & Zhang, 2020; Krishnan, Wang, & Yu, 2021) and media coverage (e.g. Milbourn, 2003; Rajgopal, Shevlin, & Zamora, 2006). Economic theory also suggests that managers with significant reputations at stake will not, because of career concerns, indulge in opportunistic rent-seeking behavior (Fama, 1980) [3]. Thus, given the negative impact that loss of reputation can have on a manager's career, we expect that managers with higher abilities who clearly have greater employment opportunities and thus, more to lose, will have less incentive to engage in aggressive tax avoidance activities.

Second, Hanlon and Heitzman (2010) and Armstrong, Blouin, Jagonlizer, and Larcker (2015) point out that tax planning is an investment decision like any other investment opportunity. Managers' decisions regarding tax aggressiveness are determined not only by

whether tax aggressiveness has a positive net present value (NPV), but also by how the NPV of tax aggressiveness compare with the NPV of other investment options. Financial theory tells us that rational managers should devote greater resources and efforts to projects that offer the highest positive NPV (Simon, 1973). To the extent that managers with superior ability can achieve higher increases in shareholder value through traditional investment options, the NPV of traditional investments would be relatively higher than the NPV of tax aggressiveness. Consequently, managers with higher abilities should have more incentive to invest in traditional investment opportunities and less incentive to engage in aggressive tax avoidance activities. This argument is consistent with the survey evidence in Graham *et al.* (2014), showing that managers rank "lacking business purpose and/or economic substance" as the *most* important reason for not implementing a tax strategy.

Demerjian, Lev, and McVay (2012) quantify managerial ability by calculating how efficiently managers generate revenues from given economic resources using the data envelopment analysis (DEA) approach. Their study provides a comprehensive validity test that demonstrates that their method of measuring managerial ability is superior to other measures (e.g. abnormal returns, performance, tenure and media coverage) with respect to capturing individual talent. Other studies (e.g. Baik, Farber, & Lee, 2011; Demerjian *et al.*, 2013; Francis *et al.*, 2019) use this measure and find that managerial ability is positively related to earnings quality, management earnings forecast and firm performance. Given its superior power to capture managerial ability regarding traditional operational efficiency, Dermerjian *et al.*'s (2012) managerial ability score is well-suited for our empirical analyses given the underlying theoretical framework of our paper.

Because we are interested in the aggressive end of tax avoidance, following prior studies (e.g. Wilson, 2009; Rego & Wilson, 2012; Kim & Zhang, 2016), we use tax shelter probability, predicted unrecognized tax benefits (UTB) and the bottom quintile of industry and year adjusted cash effective tax rate (CETR) as our primary measures of tax aggressiveness. To mitigate the reverse causality concern, following prior studies such as those by Dermerjian *et al.* (2013), Hoi *et al.* (2013) and Allen *et al.* (2016), we measure managerial ability one year prior to our tax aggressiveness proxies.

Using a sample of 42,329 firm-year observations, we find a *negative* and significant relationship between managerial ability and tax aggressiveness after controlling for firm-level factors that have been shown to impact tax aggressiveness, indicating that more able managers are less likely to engage in aggressive tax avoidance. Our results are robust to the use of alternative measures of tax aggressiveness and managerial ability. Our results are also robust to using firm fixed effects regressions to address omitted variable bias and to using two- or three-year lags with managerial ability to further mitigate concerns about reverse causality.

To further mitigate endogeneity concerns, we employ a difference-in-differences approach using information regarding managerial turnover. Specifically, we identify a treatment sample of firms that were managed by low-ability managers prior to the turnover but came under the management of high-ability managers subsequent to such turnover. We also construct a control sample of firms that were managed by low-ability managers and remained that way following managerial turnovers. The difference-in-differences results indicate that a low-to-high managerial ability switch leads to a significant reduction in the level of tax aggressiveness compared to a low-to-low managerial ability switch.

In this paper, we argue that higher ability managers are associated with fewer aggressive tax avoidance activities because they can convert resources into economic benefits more efficiently through traditional operations and therefore have less incentive to engage in aggressive tax avoidance activities. To the extent that this is the case, we should observe that the negative relationship between managerial ability and tax aggressiveness is more significant when a firm has higher investment opportunities. To test this conjecture, we

interact managerial ability and proxies of investment opportunities (i.e. firms with higher capital expenditures or firms with higher market-to-book (M/B) ratios) and re-estimate our regressions. We find that the identified relationship is significantly stronger for firms with higher investment opportunities. This finding provides support for our conjecture that traditional investment opportunities provide a plausible channel through which managerial ability affects tax aggressiveness.

In this paper, we also contend that managers with higher abilities have higher reputations and, therefore, more opportunities in the managerial labor markets. As such, they will be less likely to engage in aggressive tax avoidance activities given the significant negative impact it could have on their reputation and hence their career possibilities if discovered. We test this conjecture by interacting managerial ability and managerial reputational pressure as measured by whether a firm belongs to the S&P 1,500 firm (Denis, McConnell, Ovtchinnikov, & Yu, 2003) or a firm is covered by more financial analysts (Allen *et al.*, 2016). We find evidence that the negative relation between managerial ability and tax aggressiveness is more pronounced for firms with higher reputational pressure. This finding provides support for the argument that concerns with regard to managerial reputations are a channel through which managerial ability negatively affects tax aggressiveness.

Our paper contributes to the growing literature on the determinants of corporate tax aggressiveness. Our findings advance the understanding of the "under-sheltering puzzle", that questions why some firms actively engage in aggressive tax avoidance activities whereas others do not (Weisbach, 2002), and which according to Gallemore, Maydew, and Thornock (2014), "is very much an open question in the literature." We contend that it is important that firms' aggressive tax planning is viewed as investment decisions with significant costs that are less attractive options for managers who have greater abilities to realize higher increases in shareholder value through traditional investments. Our finding supports this conjecture, and it provides a reasonable explanation for why some firms voluntarily forgo tax aggressiveness opportunities. Furthermore, our paper extends the work of Dyreng *et al.* (2010) by providing a plausible explanation for the relationship between managerial fixed effects and firm tax decisions. Our finding, which sheds light on this relationship, moves the literature forward.

Our paper also contributes to the growing research on the attributes of managers, particularly managerial ability. Managerial ability has been an important topic of extensive research in the economic and management literatures (e.g. Shavinina & Medvid, 2009). More recent studies introduce this topic into finance and accounting research and find that managerial ability is an important factor that affects firm performance and corporate accounting decisions, including earnings quality and management earnings forecasts (Baik *et al.*, 2011; Demerjian *et al.*, 2012, 2013; Francis, Ren, *et al.*, 2016, 2019). Our study finds that managerial ability also significantly affects corporate tax decisions. Additionally, our findings have important public policy implications for regulators, investors and managerial labor markets.

2. Literature review and theoretical framework

This section discusses related literature, highlights our contribution and formulates the hypothesis on the relationship between tax aggressiveness and managerial ability.

2.1 Incremental contribution in relation to contemporary studies

A contemporary work by Koester, Shevlin, and Wangerin (2017) examines the relation between managerial ability and general tax avoidance. Koester *et al.* (2017) find that there is a positive relation between *concurrent* managerial ability and tax avoidance as measured by

various forms of cash effective tax rate. Koester *et al.* (2017) focus on general tax avoidance; in contrast, our paper focuses on tax aggressiveness which is a subset of tax avoidance, and importantly, its underlying positions are likely to have weak legal support (Lisowsky, Robinson, & Schmidt, 2013). Consequently, tax aggressiveness is more likely to be challenged by the tax authority and faces public scrutiny (Dyreng *et al.*, 2016). It should also be noted that studies on tax aggressiveness are of more interest to academics, regulators and policy makers (Hanlon & Heitzman, 2010).

The findings in our paper, as well as in Koester *et al.* (2017), are consistent with Chyz and Gaertner (2018) and Armstrong *et al.* (2015). Chyz and Gaertner (2018) find a nonlinear relationship between forced CEO turnover and firm's tax avoidance activities. Specifically, they show that CEOs that engage in excessive tax avoidance and too little tax avoidance are more likely to experience forced turnover. Armstrong *et al.* (2015) show that good corporate governance is positively (negatively) related to extremely low (high) levels of tax avoidance. This suggests that high-ability managers might not forgo general tax avoidance opportunities if such investments are associated with less risk. However, when certain aggressive tax strategies are associated with high levels of risk, high-ability managers would have less incentive to undertake such investments.

Lisowsky *et al.* (2013) show that the various measures of tax avoidance reside along the continuum that spans from perfectly legitimate positions on the left to the extremely uncertain positions on the right. They further point out that CETR is on the very left of the continuum while tax sheltering and UTB are on the very right of the continuum. Koester *et al.* (2017) use CETR as their primary measure of tax avoidance while our paper uses tax shelter probability and predicted UTB as our primary measures of tax aggressiveness.

Another major difference between our paper and Koester *et al.* (2017) is that, although both of us use Demerjian *et al.'s* (2012) managerial ability measure, we use lagged managerial ability measure while Koester *et al.* (2017) use contemporaneous managerial ability measure. When we test the robustness of our results by using a contemporaneous managerial ability, we continuously find a negative relation between managerial ability and tax aggressiveness. Our paper, therefore, compliments the work of Koester *et al.* (2017) in that we examine aspects of tax avoidance that are at different ends of the (tax avoidance) continuum. By focusing on the opposite ends of the continuum, we are able to complete the picture of the impact of managerial ability on firms' tax avoidance and, as such, further our understanding of this important issue.

2.2 Theoretical framework

The literature on corporate tax avoidance, particularly the aggressive end of tax avoidance, is relatively young, and "the field cannot explain the variation very well" (Hanlon & Heitzman, 2010, p.145). Recently, a growing number of studies have begun to examine this question (e.g. Armstrong *et al.*, 2012; Rego & Wilson, 2012; Chyz *et al.*, 2013; Hoi *et al.*, 2013; McGuire *et al.*, 2014; Hasan, Hoi, Wu, & Zhang, 2017). However, most studies focus on firm-level characteristics or corporate governance mechanisms and largely ignore how individual managers impact corporate tax aggressiveness. This is surprising given the fact that corporate decisions are made by individuals and as shown by Bertrand and Schoar (2003) individuals' "styles" play a significant role in making strategic and operational decisions.

One exception in the literature is Dyreng *et al.* (2010), who focus on the individual impact of top managers. Examining a group of executives that switch firms, these authors find that the top management team plays a significant role in determining firm tax avoidance activities that cannot be explained by firm characteristics. Although this study is an important first step in examining individual managers' effects on tax avoidance, the authors are not able to explain the variation among managers' individual effects in that they find that common

observable characteristics such as education, gender and age are not associated with executives' propensities to reduce taxes. Thus, Hanlon and Heitzman (2010) call for more research into *how* manager-effects impact corporate tax avoidance. Chyz (2013) sheds some light on this issue and provide evidence showing that managers who aggressively avoid personal taxes are also more likely to engage in tax sheltering in the firms that they manage, suggesting that individual personal tax attitude affects his/her tax decisions of the firms in which they are employed. Additionally, Francis, Hasan, Sun, and Wu (2016) find that CEOs with political affiliations are more tax aggressive than CEOs without political affiliations.

We believe that studying the effects of managerial ability on firms' tax aggressiveness could further the understanding of how individual managers affect tax aggressiveness and advance the literature in this regard. As discussed above, managerial ability captures managerial human capital (Francis *et al.*, 2008) and is "one of the most important intangible assets that a firm has" (Gaines-Ross, 2003). Prior studies find that managerial ability has significant impacts on corporate finance and investment policies that are crucial to the success of corporations (e.g. Rose & Shepard, 1997; Bertrand & Schoar, 2003; Shavinina & Medvid, 2009). More recent studies introduce managerial ability to the accounting and finance literature and find that managerial ability is positively related to earnings quality (Demerjian *et al.*, 2013), management earnings forecast (Baik *et al.*, 2011) and firm performance (Demerjian *et al.*, 2012).

The question exists as to how managerial ability affects corporate tax aggressiveness. We argue that managers should weigh both costs and benefits when determining tax aggressiveness. In addition, higher ability managers might have different perceptions about the marginal cost of tax aggressiveness compared with lower ability managers.

The conjecture that tax aggressiveness provides direct benefits is based on the intuition that tax aggressiveness produces tax savings. The potential tax savings from aggressive strategies could be economically large [4]. However, an increasing number of recent studies find that tax avoidance activities, especially aggressive tax avoidance activities, incur significant costs that are both direct and indirect (e.g. Balakrishnan, Blouin, & Guay, 2019). Direct costs include tax planning costs, litigation and other expenses of mounting a defense against challenges from the tax authorities, back taxes, potentially hefty penalties and fines imposed by the tax authorities and more rigorous scrutiny from tax authorities in the long run (i.e. being blacklisted by the IRS), and direct costs can be substantial [5].

There are also indirect costs associated with aggressive tax avoidance activities, such as reputational costs. In responding to the survey by Graham *et al.* (2014), public firm top executives rank "potential harm to their firms' reputations" and "adverse media attention" as the second and the fourth most important factors affecting their decisions regarding which tax planning strategies to implement [6]. Austin and Wilson (2017) provide empirical evidence showing that firms view potential reputation losses among their consumers as an important factor in determining tax policy. Specifically, they find that firms with more valuable brands have higher effective tax rates than their matched counterparts. Besides the reputation concern on the firm level, tax aggressiveness also imposes the reputation effect on managers themselves. Chyz and Gaertner (2018) show that the forced CEO turnover is the highest for observations with the lowest and the highest quintiles of tax avoidance, providing the first empirical evidence that CEO's reputational cost in the labor market plays a significant role in their choices of tax policies.

It is well-established that managerial ability is tightly connected to managerial and firm reputation (e.g. Fee & Hadlock, 2003; Milbourn, 2003; Rajgopal *et al.*, 2006; Doukas & Zhang, 2020; Krishnan *et al.*, 2021). More capable managers are more recognized and reputable in the labor market. It is argued that mangers with reputation at stake tend to be more careful in making decisions, because they have more to lose in terms of their reputation in the labor market (Fama, 1980; Jian & Lee, 2011). Krishnan *et al.* (2021) argue that managers with higher

ability have more market-based incentives to protect their career prospects as well as the reputation of their firms. Falato, Li, and Milbourn (2015) and Graham, Li, and Qiu (2012) state that high-ability managers have more to lose in terms of compensation and reputation if unexpected negative shocks in the future lead to a poor mapping of current earnings to future earnings realizations. Supporting this prediction, Baik, Choi, and Farber (2020) find that high-ability managers are less likely to engage in earnings smoothing. Haider, Singh, and Sultana (2021) find a positive relationship between managerial ability and accounting conservatism, suggesting that more capable managers are concerned about reputation losses due to failure to produce high earnings quality. Doukas and Zhang (2020) and Demerjian, Lewis-Western, and McVay (2020) show that because high-ability managers gain more lifelong rewards due to their reputation, they are more likely to avoid reputationally harmful behavior. Accordingly, given the potential reputational cost of tax aggressiveness, we expect that the marginal cost of engaging in aggressive tax avoidance activities is higher for managers with higher abilities than for managers with lower abilities, and consequently, higher ability managers have less incentive to engage in aggressive tax avoidance activities than lower ability managers.

Next, we argue that with the cost-benefit analysis, managers would choose between tax planning investments and other traditional investments. The potential costs, including direct costs and reputational costs, may offset the potential benefits generated from aggressive tax planning strategies, pushing managers to forego these strategies. Even if a corporate aggressiveness strategy has a positive NPV, managers could still invest "too little" or "too much" in it (Armstrong *et al.*, 2015). Managerial ability is one of the important managerial characteristics that could drive this variation. As managers' effort and time are limited, rational managers should devote greater effort and time to projects that offer the highest positive NPV (Simon, 1973). If a manager has higher abilities to turn economic resources into revenues more efficiently through traditional investments, the NPV of these investments would be higher than the NPV of tax aggressiveness. Consequently, a more able manager should have greater incentive to invest in traditional operations and less incentive to engage in aggressive tax avoidance activities compared with a lower ability manager.

Based on the discussion above, we formalize our hypothesis as follows:

H1. Managerial ability is negatively related to the level of corporate tax aggressiveness.

3. Research design, sample selection and summary statistics

3.1 Measures of managerial ability

Following the recent managerial ability literature, we use the measure developed in Demerjian *et al.* (2012) as our primary proxy for managerial ability. The estimation of managerial ability from this study consists of a two-stage process that begins with an estimation of total firm efficiency using DEA. According to Demerjian *et al.* (2012, p. 4), "DEA is a statistical procedure used to evaluate the relative efficiency of separable entities, termed 'decision-making units (DMUs)', where each DMU converts certain inputs (labor, capital, etc.) into outputs (revenue, income, etc.)."

In their model, individual firms serve as the DMUs. Revenues represent outputs, and seven financial items (i.e. net property, plant and equipment; net operating leases; net research and development costs; purchased goodwill; other intangible assets; cost of inventory and selling, general and administrative expenses) represent inputs. In the first stage, total firm efficiency is estimated by using an optimization procedure that allows varying weights for each input and output. In the second stage, by regressing total firm efficiency on various company characteristics (i.e. size, market share, cash availability, life cycle, operational complexity and foreign operations), total firm efficiency is decomposed into firm and managerial parts [7].

Demerjian *et al.* (2012) note that the DEA approach allows efficiency to be calculated based on a practical optimum level rather than on average performance. As such, they contend and provide empirical evidence that it is superior to other proxies (e.g. historical returns or performance, tenure and media coverage) with respect to its association with managerial fixed effects, price reactions to CEO turnover announcements and the subsequent performance of companies with new CEOs.

Demerjian *et al.* (2012) point out that their managerial ability measure primarily captures the component of a firm's traditional investment efficiency that is attributed to the manager. Studies by Baik *et al.* (2011) and Demerjian *et al.* (2013) use this measure and find that managerial ability is positively related to management earnings forecast, earnings quality and firm performance, which are aspects of firm behavior that have previously been shown to be directly attributed to managerial behavior. Because we argue that managers' tax aggressiveness decisions depend on the NPV of other traditional investment options, this measure is particularly well suited for our study.

Nonetheless, we acknowledge that Demerjian *et al.*'s (2012) measure might still be subject to measurement errors primarily because the residuals from the second stage model may yet contain omitted factors that affect firm efficiency and that cannot be attributed to management. In our robustness checks, we also use managerial ability ranking and historical stock returns as alternative measures of managerial ability.

3.2 Measures of tax aggressiveness

In this paper, we are interested in aggressive tax avoidance strategies that could be associated with various risks. Following Wilson (2009), Rego and Wilson (2012) and Kim and Zhang (2016), we use tax shelter probability, predicted UTB and the bottom quintile of industry and year adjusted CETR as our primary measures of tax aggressiveness.

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 tax shelter probability is associated with the stock price crash risk (Kim, Li, & Zhang, 2011), the sensitivity of a manager's wealth to stock return volatility (Rego & Wilson, 2012) and irresponsible corporate social activities (Hoi *et al.*, 2013).

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) 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. In addition, the lack of a clear standard also resulted in scant and opaque UTB disclosures prior to FIN 48 (Gleason & Mills, 2002; Blouin, Gleason, Mills, & Sikes, 2010). Because our sample period is 1988-2009, we do not have actual UTB information for most years of our sample period. Following Rego and Wilson (2012) and Boone, Khurana, and Raman (2013), we estimate the predicted UTB level based on the estimated coefficients from the prediction model in Rego and Wilson (2012). Please see Table A1 for a detailed calculation of tax shelter probability and Predicted UTB.

One potential issue with Tax shelter probability and Predicted UTB is that both are estimated based on a linear combination 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, similar to Kim and Zhang (2016), we use Dummy (CETR) as the third measure of tax aggressiveness. We first calculate CETR for each firm each year. CETR is the ratio of cash tax paid over pretax income, adjusted for special items. Given the differences of tax aggressiveness among different industries, we further calculate industry adjusted CETR. We then sort this industry adjusted CETR each year. We create a dummy variable, Dummy (CETR), which equals one if a firm's industry adjusted CETR in a particular year is in the bottom quintile of the sample in that year.

It should be noted that measures of corporate tax aggressiveness are necessarily complicated and that there is no single measure that can satisfy all research purposes [8]. In our supplemental analyses, we also use three alternative measures to capture tax aggressiveness. They are permanent and discretionary book-tax differences (DTAX as in Frank, Lynch, & Rego, 2009), the usage of international tax haven subsidiaries (Dyreng & Lindsay, 2009) and Dummy (ETR). Table A1 provides detailed descriptions of these tax aggressiveness measures.

3.3 Baseline regression model

We use the following empirical model to test the empirical relationship between managerial ability and tax aggressiveness:

$$\text{Tax aggressiveness}_t = f(\text{Managerial ability}_{t-1},\ \text{Firm attributes}_{t-1},\ \text{Industry effects},\ \text{and}\ \ \text{Year effects}) \tag{1}$$

where Tax aggressiveness$_t$ and Managerial ability$_{t-1}$ are defined as above. Following Francis *et al.* (2008), Demerjian *et al.* (2013) and Hoi *et al.* (2013), we use lagged values of managerial ability measures and firm attributes in our estimations. Using lagged information of managerial ability is appropriate and important. First, tax aggressiveness strategies are long-term in nature (Dyreng, Hanlon, & Maydew, 2008; Hanlon & Heitzman, 2010). The impact of managerial ability on tax aggressiveness should thus take time to be reflected in observed tax aggressiveness measures. Second, endogeneity is of serious concern in this study. For example, tax aggressiveness could impact other expenditures that are used to calculate managerial ability that could thus impact the managerial ability measure as a consequence. Using lagged information can partially mitigate concerns regarding potential reverse causality (Hoi *et al.*, 2013).

Following Rego (2003), Chen *et al.* (2010), Hope, Ma, and Thomas (2013) and Hoi *et al.* (2013), we include the following firm attributes in our model; the natural logarithm of the market value of equity (Size); the market-to-book ratio (M/B); the financial leverage (Leverage); the cash and short-term investments (Cash holding); the net operating loss carryforward (NOL); the change in net operating loss carryforward (Change NOL); the return on assets (ROA); the reported foreign earnings (Foreign income); the equity income (Equity income); the property, plant and equipment (PPE) and the intangibility (Intangible assets). A more detailed definition for each variable can be found in Table A1.

3.4 Sample selection and summary statistics

We estimate the baseline regression model in Equation (1) using data from two sources. We obtain managerial ability data from Professor Peter Demerjian at the University of Illinois, Chicago [9], and the corresponding financial information from Standard and Poor's Compustat database. After merging the two datasets, we obtain a final sample of 42,329 firm-year observations for 7,001 unique firms for the 1988–2009 period [10].

Panel A of Table 1 reports sample statistics. The mean value of Tax shelter probability is 0.416, the mean value of Predicted UTB is 0.008 and the mean value of Dummy (CETR) is

Variables	*N*	Mean	SD	P25	P50	P75
Tax shelter probability	27,967	0.416	0.215	0.308	0.452	0.618
Predicted UTB	37,892	0.008	0.011	0.004	0.007	0.012
Dummy (CETR)	42,329	0.201	0.402	0.000	0.000	0.000
MA score	42,329	0.017	0.136	−0.070	0.007	0.092
Size	42,329	5.359	1.965	3.966	5.299	6.691
M/B	42,329	2.693	3.036	1.187	1.960	3.261
Leverage	42,329	0.211	0.191	0.029	0.182	0.334
Cash holding	42,329	0.146	0.173	0.021	0.075	0.214
NOL	42,329	0.287	0.453	0.000	0.000	1.000
Change NOL	42,329	0.008	0.291	0.000	0.000	0.000
ROA	42,329	0.077	0.087	0.028	0.063	0.111
Foreign income	42,329	0.011	0.037	0.000	0.000	0.005
Equity income	42,329	0.001	0.047	0.000	0.000	0.000
PPE	42,329	0.322	0.268	0.119	0.247	0.446
Intangible assets	42,329	0.147	0.214	0.000	0.055	0.210

Note(s): This table presents the firm-year level descriptive statistics for the tax aggressiveness variables, managerial ability variables and firm attribute variables. Detailed definitions of variables are provided in Table A1

Table 1.
Summary statistics

0.201. These values are similar to those reported in prior studies. For example, Kim *et al.* (2011) report the mean values of Tax shelter probability as 0.476. Boone *et al.* (2013) report the mean values of Predicted UTB as 0.010. We find that the mean value of MA Score is 0.017. Other sample firm-year statistics are in the range of those reported in earlier studies.

4. The relationship between managerial ability and tax aggressiveness

4.1 Baseline regression results

Table 2 presents the results of the baseline model using ordinary least squares (OLS) regressions with firm-clustered, heteroskedasticity-robust standard errors. We use the MA

Variables	(1) Tax shelter probability	(2) Predicted UTB	(3) Dummy (CETR)
MA score	*−0.022*** *(−2.68)*	*−0.005*** *(−6.00)*	*−1.459*** *(−10.08)*
Size	0.097*** (129.98)	0.001*** (10.80)	−0.328*** (−25.90)
M/B	0.001** (2.13)	0.001* (1.68)	0.025*** (4.78)
Leverage	−0.157*** (−21.91)	−0.001 (−1.60)	1.727*** (15.74)
Cash holding	0.011 (1.47)	0.002** (2.51)	1.032*** (8.55)
NOL	0.025*** (10.16)	0.001* (1.94)	0.869*** (21.28)
Change NOL	−0.001 (−0.40)	0.000 (0.53)	−0.113** (−2.56)
ROA	0.405*** (26.03)	0.014*** (10.38)	−0.695*** (−3.38)
Foreign income	0.787*** (11.49)	0.010** (2.56)	−3.478*** (−4.69)
Equity income	0.024*** (3.67)	−0.012*** (−4.03)	0.552 (0.61)
PPE	−0.007 (−1.12)	−0.006*** (−11.50)	0.198* (1.87)
Intangible assets	−0.025*** (−4.26)	−0.008*** (−12.96)	−0.166* (−1.70)
Observations	27,967	37,891	42,329
Adjusted/Pseudo *R*-squared	0.795	0.166	0.101

Note(s): This table presents the OLS regression results of the baseline model. The dependent variables are Tax shelter probability, Predicted UTB and Dummy (CETR). Detailed definitions of variables are provided in Table A1. We also control for industry effects and year effects in the regressions. Standard errors are adjusted for heteroskedasticity and within-firm clustering. *T*-statistics are in parentheses. Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 2.
Managerial ability and tax aggressiveness: baseline regression results

score as the test variable. Column 1 results show that the coefficient on the MA score is −0.022 and is significant at the 1% level when we use Tax shelter probability as the measure of tax aggressiveness. In Column 2, the coefficient on the MA score is −0.005 and is significant at the 1% level when we use Predicted UTB as the measure of tax aggressiveness. We also find that the results are consistent when we use Dummy (CETR) as the measure of tax aggressiveness. Overall, these results show that firms with higher managerial ability are associated with lower tax aggressiveness after controlling for firm characteristics and industry and year effects.

The coefficients for the control variables are generally consistent with those reported in the literature (e.g. Chen *et al.*, 2010; Hoi *et al.*, 2013; Hope *et al.*, 2013). Large firms, those with high M/B, NOL, cash holdings and foreign income are more likely to avoid taxes aggressively.

Overall, the results from the baseline regressions support our hypothesis that firms with more able managers are associated with significantly lower levels of tax aggressiveness compared with firms that have less able managers.

4.2 Difference-in-differences analysis: evidence from CEO turnover

Although we find a negative relationship between managerial ability and tax aggressiveness, it is possible that some omitted time variant variables are correlated with both managerial ability and tax aggressiveness, thereby biasing our results. Additionally, it is possible that firms that might save more from tax aggressiveness would be less cash constrained and that managers would have less pressure to exert extra effort in managing the firm, which could lead to lower scores on managerial abilities. Accordingly, there might be a feedback effect from tax aggressiveness to managerial ability that could make it difficult to draw a causal interpretation from the baseline regression results. To mitigate endogeneity concerns, we use CEO turnover as a quasi-natural experiment and apply a difference-in-differences approach (e.g. Kim, Moshirian, & Wu, 2005, 2006; Robin, Wu, & Zhang, 2017). We acknowledge that CEO turnover events are not exogenous in nature in that it could be affected by both managerial ability and tax aggressiveness, so this test cannot totally solve the endogeneity issue. Rather it serves more as additional evidence to triangulate the finding from the baseline regressions.

We focus on two types of CEO turnover made by firms initially run by low-ability CEOs. For the first type, firms make a lateral change by switching to another low-ability CEO (the control sample). For the second type, firms achieve an increase in managerial ability by switching to a high-ability CEO (the treatment sample). We use a dummy variable (Low-to-high firms) to define whether a firm is a treatment firm or a control firm. The dummy variable (Low-to-high firms) equals one if a firm has an average MA rank below 0.5 for the pre-transition period and an average MA rank above 0.5 for the post-transition period, and it equals zero if a firm has an average MA rank below 0.5 for the pre-transition period and an average MA rank still below 0.5 for the post-transition period [11]. We use the dummy variable Post to denote observations following CEO turnover. We estimate the following specification:

$$\begin{aligned}\text{Tax aggressiveness}_t = f(&\text{Dummy(Low-to-high firms)}, \text{ Post}, \text{ Dummy(Low-to-high firms)} \\ &*\text{Post}, \text{ Firm attributes}_{t-1}, \text{ Industry effects, and Year effects})\end{aligned} \tag{2}$$

If managerial ability has a causal effect on tax aggressiveness, we expect the firms that switch from a low-ability CEO to a high-ability CEO (the treatment sample) should have a significant decrease in tax aggressiveness following the switch compared with firms that switch from a low-ability CEO to a low-ability CEO (the control sample).

We obtain CEO turnover information from ExecuComp. We construct our CEO turnover samples using the following filters: (1) Both pre- and post-transition CEOs must be CEOs for three consecutive years (excluding the transition year); (2) To avoid the confounding effect of multiple CEO turnover on our results, if a firm changes its CEO more than once, we only count the first CEO turnover and discard subsequent CEO turnover in our sample period. The resulting sample is then merged with our tax aggressiveness sample. Defining our data in this manner, our treatment sample consists of 38 low-to-high firms, and our control sample consists of 110 low-to-low firms.

Table 3 reports the difference-in-differences test results. Columns 1 to 3 contain results where Tax shelter probability, Predicted UTB and Dummy (CETR) are the dependent variables. We find that for all three models, the coefficients on Dummy (Low-to-high firms) *Post are significantly negative. The results suggest that if a firm switches from a low-ability CEO to a high-ability CEO, its tax aggressiveness level is significantly reduced compared with a firm that switches from a low-ability CEO to another low-ability CEO. These results show that managerial ability has a negative effect on tax avoidance, and they triangulate the finding from the baseline regressions.

4.3 Robustness checks

4.3.1 Firm fixed effect regression results. We include common determinants of tax aggressiveness in our baseline model. However, our model specifications might still be omitting unknown time invariant firm characteristics that could lead to alternative explanations of our findings. To ease this concern, we run firm fixed-effects regressions to control for the influence of unknown firm-level factors. We report the results in Table 4, Panel A. The firm fixed-effects regression results are similar to those from the baseline model. In particular, all coefficients on managerial ability measures are negative and significant, which

Variables	(1) Tax shelter probability	(2) Predicted UTB	(3) Dummy (CETR)
Dummy (low-to-high firm)	0.017** (2.15)	0.005*** (6.55)	0.689** (2.04)
Post	−0.011 (−1.05)	0.003*** (3.15)	−0.218 (−0.49)
Dummy (low-to-high firm)*Post	*−0.019** (−1.74)*	*−0.003**** (−2.69)*	*−1.131*** (−1.99)*
Size	0.098*** (38.57)	0.001*** (5.38)	−0.318*** (−2.89)
M/B	−0.004** (−2.43)	0.000 (1.49)	−0.064 (−1.09)
Leverage	−0.071*** (−2.88)	−0.004* (−1.66)	2.273** (2.17)
Cash holding	0.129*** (4.31)	0.006** (2.54)	2.979*** (2.70)
NOL	0.023*** (3.25)	0.002*** (3.19)	0.610** (2.06)
Change NOL	−0.008 (−0.75)	0.000 (0.55)	0.532 (1.23)
ROA	0.283*** (4.99)	0.002 (0.34)	−2.627 (−1.20)
Foreign income	0.810*** (7.37)	0.034*** (3.94)	0.508 (0.10)
Equity income	0.316 (0.63)	−0.073 (−1.61)	−7.705 (−0.31)
PPE	0.061*** (3.28)	−0.000 (−0.23)	−0.507 (−0.59)
Intangible assets	−0.069*** (−2.94)	−0.009*** (−4.46)	−1.568 (−1.35)
Observations	620	888	813
Adjusted/Pseudo *R*-squared	0.881	0.364	0.224

Note(s): This table presents difference-in-difference regression results. We compare tax aggressiveness for firms that switch from a low-ability manager to a high-ability manager (the treatment sample) and firms that switch from a low-ability manager to another low-ability manager (the control sample). The dependent variables are Tax shelter probability, Predicted UTB and Dummy (CETR). Detailed definitions of variables are provided in Table A1. We also control for industry effect and year effect in the regressions. Standard errors are adjusted for heteroskedasticity and within-firm clustering. *T*-statistics are in parentheses. Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 3. Managerial ability and tax aggressiveness: difference-in-differences analysis

Panel A: Firm fixed effects

Variables	(1) Tax shelter probability	(2) Predicted UTB	(3) Dummy (CETR)
MA score	−0.011* (−1.91)	−0.005*** (−10.36)	−2.018*** (−11.40)
All other controls	Y	Y	Y
Observations	27,967	37,891	25,765
Adjusted/Pseudo *R*-squared	0.891	0.579	0.052

Panel B: Two-year or three-year lags of managerial ability

Variables	(1) Tax shelter probability	(2) Predicted UTB	(3) Dummy (CETR)	(4) Tax shelter probability	(5) Predicted UTB	(6) Dummy (CETR)
MA score (two-year lag)	−0.017** (−2.11)	−0.001* (−1.72)	−1.196*** (−8.46)			
MA score (three-year lag)				−0.020** (−2.37)	−0.002*** (−2.98)	−1.012*** (−7.03)
All other controls	Y	Y	Y	Y	Y	Y
Observations	26,536	36,722	40,222	24,862	34,501	37,712
Adjusted/ Pseudo *R*-squared	0.797	0.197	0.100	0.799	0.209	0.101

Note(s): Panel A presents results using firm fixed effect regressions. Panel B presents results using two-year or three-year lag of managerial ability. The dependent variables are Tax shelter probability, Predicted UTB and Dummy (CETR). Detailed definitions of variables are provided in Table A1. In both panels, we control for industry effects and year effects. Standard errors are adjusted for heteroskedasticity and within-firm clustering. *T*-statistics are in parentheses. Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 4.
Managerial ability and tax aggressiveness: robustness checks

indicates that the baseline regression results are not plagued by serious omitted variable problems.

4.3.2 Two-year and three-year lag of managerial ability. Demerjian *et al.* (2013) use one-to three-year lags of managerial ability to examine the effect of managerial ability on various aspects for earnings quality. Because corporate tax aggressiveness strategies are long-term in nature, we use a one-year lag of managerial ability in our baseline model. The impact of managerial ability on tax aggressiveness could take more than one year to be reflected in the observed measures. Thus, we further examine the relationship between managerial ability and tax aggressiveness by using two-year and three-year lags of managerial ability. We report the results in Panel B of Table 4. Again, we find that all coefficients on the two-year and three-year lags of managerial ability are negative and significant, which confirms the negative impact of managerial ability on tax aggressiveness. These results further mitigate the reverse causality concern in our study.

4.3.3 Other robustness checks. We also conduct other robustness checks. First, we estimate the baseline model using a reduced sample that requires industry year with more than 100 unique firms to address a potential upward bias problem of the managerial ability measure. Second, we test the sensitivity of our results using two alternative samples, that is the sample before 1994 and the sample before the financial crisis. Finally, we conduct the tests using alternative measures for tax aggressiveness (discretionary permanent book-tax differences, the usage of tax havens and low effective tax rates) and alternative measures for managerial ability (the decile ranked MA and industry-adjusted stock returns). Our results still hold for

the above robustness tests. The detailed discussion and results can be found in the online Table A1.

5. Channel tests

5.1 The effect of investment opportunities

In this paper, we argue that it is important that firms' tax aggressiveness policies be viewed as investment decisions that provide economic benefits and consume resources. We contend that higher ability managers are better able to exploit traditional investment opportunities, which suggests that tax aggressiveness should be a less attractive option because, as noted by Graham *et al.* (2014) and others, this strategy is characterized by significant costs. We therefore expect that the negative relationship between managerial ability and tax aggressiveness would be amplified if a firm has richer alternative investment opportunities.

To test this conjecture, we construct two proxies for investment opportunity and interact them with managerial ability in the baseline model. Capital expenditures are the direct measure of investment opportunities, so our first measure is Dummy (High capital expenditure), which equals one if a firm has an above-the-sample-median capital expenditure and zero otherwise. It is generally accepted that firms with higher M/B ratios enjoy richer investment opportunities. Thus, the second measure of investment opportunity is a Dummy (High M/B) that equals one if a firm has an above-the-sample-median M/B and zero otherwise.

The results are shown in Table 5. In Panel A, we use Dummy (High capital expenditure) as the proxy for investment opportunities. We find that for all three coefficients on the

Panel A: Using capital expenditure as proxy for investment opportunities

Variables	(1) Tax shelter probability	(2) Predicted UTB	(3) Dummy (CETR)
Dummy (high capital expenditure)	−0.002 (−1.07)	−0.001*** (−7.96)	−0.102*** (−2.87)
MA score	−0.013 (−1.29)	−0.003*** (−3.18)	−1.624*** (−9.12)
Dummy (high capital expenditure)* MA score	*−0.029*** (−2.23)*	*−0.003*** (−2.44)*	*−0.553*** (−2.26)*
All other controls	Y	Y	Y
Observations	27,967	37,891	42,329
Adjusted/Pseudo *R*-squared	0.795	0.169	0.101

Panel B: Using M/B as proxy for investment opportunities

Variables	(1) Tax shelter probability	(2) Predicted UTB	(3) Dummy (CETR)
Dummy (high M/B)	−0.003 (−1.15)	−0.000 (−0.93)	−0.226*** (−6.02)
MA score	−0.010 (−0.84)	−0.003*** (−3.05)	−1.522*** (−8.13)
Dummy (high M/B)* MA score	*−0.024* (−1.77)*	*−0.003*** (−2.22)*	*−0.232 (−1.01)*
All other controls	Y	Y	Y
Observations	27,967	37,891	42,329
Adjusted/Pseudo *R*-squared	0.795	0.167	0.102

Note(s): This table presents the OLS regression results on the effects of investment opportunities on the relation between managerial ability and tax aggressiveness. The dependent variables are Tax shelter probability, Predicted UTB and Dummy (CETR). Dummy (High capital expenditure) equals one if a firm's capital expenditure ratio is above sample median and zero otherwise. Dummy (High M/B) equals one if a firm's M/B is above sample median and zero otherwise. Detailed definitions of variables are provided in Table A1. We also control for industry effect and year effect in the regressions. Standard errors are adjusted for heteroskedasticity and within-firm clustering. *T*-statistics are in parentheses. Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 5.
Managerial ability and tax aggressiveness: the effect of investment opportunities

interaction term between managerial ability and firm investment opportunities, they are negative and statistically significant, which indicates that the negative relationship between managerial ability and tax aggressiveness is more pronounced for firms with higher investment opportunities than for firms with lower investment opportunities. In Panel B, we use Dummy (High M/B) as the proxy for investment opportunities. We find two out of three coefficients on the interaction term are negative and statistically significant. In sum, the results in Table 5 are consistent with our argument that tax aggressiveness is a less attractive option for firms with richer investment opportunities. The results support the conjecture that firms' traditional investment opportunities are important channels through which managerial ability affects tax aggressiveness.

5.2 The effect of reputational pressure

As we discussed before, aggressive corporate tax avoidance activities are associated with various costs. One particular cost which might be vital for higher ability managers is reputational cost. A recent survey by Graham *et al.* (2014) finds that 69% of executives view reputational concern as important: in fact, it ranks the second in importance among the reasons that firms give for why they do not engage in potential tax planning strategies. If a manager has higher abilities, we expect that he has greater concerns about the reputational cost of tax aggressiveness and subsequently this type of manager has less incentive to engage in such aggressive activities.

To test this conjecture, we construct two proxies for managerial reputational cost and interact them with managerial ability. Denis *et al.* (2003) argue that managerial reputation cost is higher for S&P 1,500 firms than for non-S&P 1,500 firms. So our first measure to capture firms' reputation is Dummy (S&P), which has a value of one if the firm is an S&P 1,500 firm and zero otherwise. Firms with higher analyst coverage face higher reputational pressure (Allen *et al.*, 2016). So our second measure of reputational pressure is Dummy (High analyst coverage), which equals one if a firm's analyst coverage is above the sample median value and zero otherwise.

The results are shown in Table 6. In Panel A, we use Dummy (S&P) as the proxy for reputational pressure. We find that for all three coefficients on the interaction term between managerial ability and reputational pressure, they are negative, and two out of three are statistically significant, which indicates that the negative relationship between managerial ability and tax aggressiveness is more pronounced for firms with higher reputational pressure. In Panel B, we use Dummy (High analyst coverage) as the proxy for reputational pressure. We find two out of three coefficients on the interaction term are negative and statistically significant. In sum, the results in Table 6 are consistent with our argument that tax aggressiveness is a less attractive option for firms with higher reputational pressure. The results provide some support for our conjecture and suggest that managerial reputational cost could be another plausible channel through which managerial ability negatively affects tax aggressiveness.

6. Additional tests

6.1 Potential non-linear relationship

Armstrong *et al.* (2015) find a non-linear relationship between corporate governance and tax avoidance. Specifically, they find a positive relation between board independence and financial sophistication for low levels of tax avoidance, but a negative relation for high levels of tax avoidance, indicating that good corporate governance promotes extremely low levels of tax avoidance and constraints extremely high levels of tax avoidance. This raises the question whether high-quality managers also have similar non-linear impacts on tax aggressiveness. Similar to Armstrong *et al.* (2015), we use quantile regressions to test this possibility. We run quantile regressions based on the 25, 50 and 75 percentiles for both Tax

Panel A: Using S&P as proxy for reputation pressure			
	(1)	(2)	(3)
Variables	Tax shelter probability	Predicted UTB	Dummy (CETR)
Dummy (S&P)	0.010*** (3.64)	0.002*** (7.87)	0.115** (2.16)
MA score	−0.012 (−1.26)	−0.005*** (−5.27)	−1.332*** (−8.25)
Dummy (S&P)* MA score	*−0.031** (−2.05)*	*−0.001 (−1.00)*	*−0.541* (−1.81)*
All other controls	Y	Y	Y
Observations	27,967	37,891	42,329
Adjusted/Pseudo *R*-squared	0.795	0.169	0.101

Panel B: Using analyst coverage as proxy for reputation pressure			
	(1)	(2)	(3)
Variables	Tax shelter probability	Predicted UTB	Dummy (CETR)
Dummy (high analyst coverage)	0.000 (0.00)	−0.001*** (−3.55)	0.048 (0.80)
MA score	−0.020 (−1.50)	−0.004*** (−3.21)	−1.090*** (−3.66)
Dummy (high analyst coverage)* MA score	*−0.001 (−0.08)*	*−0.003** (−1.97)*	*−0.679* (−1.91)*
All other controls	Y	Y	Y
Observations	16,534	22,333	24,838
Adjusted/Pseudo *R*-squared	0.768	0.191	0.0796

Note(s): This table presents the OLS regression results on the effects of reputation pressure on the relation between managerial ability and tax aggressiveness. The dependent variables are Tax shelter probability, Predicted UTB and Dummy (CETR). Dummy (S&P) is a dummy variable, which equals one if a firm is a S&P 1,500 firm and zero otherwise. Dummy (High analyst coverage) equals one if a firm's analyst coverage is above the sample median value and zero otherwise. Detailed definitions of variables are provided in Table A1. We also control for industry effects and year effects in the regressions. Standard errors are adjusted for heteroskedasticity and within-firm clustering. *T*-statistics are in parentheses. Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 6.
Managerial ability and tax aggressiveness: the effect of reputation pressure

shelter probability and Predicted UTB. Because Dummy (CETR) is a dummy variable and we cannot run quantile regressions for it. So we use CETR as an inverse measure of tax aggressiveness and run quantile regressions. The results are reported in Table 7. We find that coefficients on MA score are all negative and significant for the 25, 50 and 75 percentiles of Tax shelter probability and Predicted UTB, and they are all positive and significant for the 25, 50 and 75 percentiles of CETR, suggesting there is no non-linear relation between managerial ability and tax aggressiveness.

6.2 Additional specification test

In this sub-section, we conduct an additional specification. The additional test is motivated by the work of Koester *et al.* (2017) that examines the contemporaneous relationship between managerial ability and tax avoidance. In terms of model specification, one major difference is that they use a contemporaneous managerial ability, whereas we use a lagged managerial ability. However, as we pointed out earlier, it is both theoretically (the long-term nature of tax strategies (e.g. Dyreng *et al.*, 2008; Hanlon & Heitzman, 2010)) and empirically (the reversed causality (e.g. Francis *et al.*, 2008; Demerjian *et al.*, 2013; Hoi *et al.*, 2013)) important to use lagged information to infer the causal effect of managerial ability on tax avoidance. Nonetheless, we conduct tests to reconcile our results to the findings in Koester *et al.* (2017).

We run our baseline model but use Concurrent MA score to replace lagged MA score as the test variable. The results are reported in Table 8. As we can see, all three coefficients on

Variables	(1) Tax shelter probability	(2) Predicted UTB	(3) CETR
Q25 MA score	−0.017* (−1.84)	−0.002*** (−3.01)	0.148*** (12.81)
Q50 MA score	−0.024*** (−2.54)	−0.003*** (−8.56)	0.171*** (18.88)
Q75 MA score	−0.034*** (−3.49)	−0.004*** (−13.79)	0.123*** (33.02)
All other controls	Y	Y	Y
Observations	27,967	37,891	42,329

Note(s): This table presents the Quantile regression results of the baseline model using the full sample of 42,329 firm-year observations for the 1988–2009 period. The dependent variables are the tax shelter probability, predicted UTB and CETR. Detailed definitions of variables are provided in Table A1. We also control for industry effects and year effects in the regressions. Standard errors are adjusted for heteroskedasticity and within-firm clustering. *T*-statistics are in parentheses. Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 7. Quantile regression results

Variables	(1) Tax shelter probability	(2) Predicted UTB	(3) Dummy (CETR)
Concurrent MA score	*−0.017* (−1.94)*	*−0.002** (−2.08)*	*−0.865*** (−5.87)*
Size	0.097*** (130.08)	0.001*** (10.59)	−0.329*** (−25.87)
M/B	0.001** (1.99)	0.000 (1.19)	0.022*** (4.14)
Leverage	−0.158*** (−21.95)	−0.001 (−1.58)	1.723*** (15.64)
Cash holding	0.010 (1.33)	0.002*** (2.73)	1.005*** (8.30)
NOL	0.025*** (10.35)	0.001** (2.47)	0.883*** (21.63)
Change NOL	−0.001 (−0.39)	0.000 (0.33)	−0.115*** (−2.60)
ROA	0.409*** (25.64)	0.014*** (9.67)	−0.751*** (−3.53)
Foreign income	0.787*** (11.49)	0.010*** (2.60)	−3.406*** (−4.63)
Equity income	0.025*** (3.77)	−0.011*** (−3.99)	0.657 (0.57)
PPE	−0.006 (−1.03)	−0.006*** (−10.59)	0.267** (2.53)
Intangible assets	−0.025*** (−4.24)	−0.008*** (−12.90)	−0.168* (−1.72)
Observations	27,891	37,792	42,205
Adjusted/Pseudo *R*-squared	0.796	0.164	0.0973

Note(s): This table presents the result of rerunning our baseline model but use concurrent MA score as the test variable. The dependent variables are the tax shelter probability, predicted UTB and CETR. Detailed definitions of variables are provided in Table A1. We also control for industry effects and year effects in the regressions. Standard errors are clustered at both firm and year levels. *T*-statistics are in parentheses. Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 8. Reconciling the evidence by using the concurrent measure of MA scores

Concurrent MA score are negative and statistically significant, confirming a negative relation between managerial ability and tax aggressiveness, even when we use a contemporaneous managerial ability as the test variable.

7. Conclusion

We examine the relationship between managerial ability and corporate tax aggressiveness, the most extreme subset of tax planning activities that are "pushing the envelope of tax law" (Hanlon & Heitzman, 2010, p. 137). Although managerial ability is shown to increase firm value, tax aggressiveness is not necessarily a value-enhancing strategy. We argue that corporate tax aggressiveness decisions should be viewed from an investment perspective. We propose that managers with higher abilities have less incentive to engage in tax aggressiveness activities because their costs (both direct and indirect) of involving such activities are higher and because high-ability managers could increase firm value more through traditional operations.

Using a sample of 42,329 firm-year observations for 7,001 U.S. firms between 1988 and 2009, we find that firms with more able managers are associated with significantly lower levels of tax aggressiveness. Our results hold for a series of robustness checks that are used to mitigate measurement error bias, omitted variable bias and the endogeneity concerns of our results. We also provide corroborating evidence to show the moderating effect of alternative investment opportunities and reputational cost on the relationship between managerial ability and tax aggressiveness.

Our study makes several contributions to the literature. First, we reinforce the importance of understanding the determinants of tax aggressiveness from an investment opportunity perspective. Second, we provide strong evidence regarding the role of managers in corporate decisions by showing that the ability of managers matters in corporate tax aggressiveness. Our main finding provides a plausible explanation for the "under-sheltering puzzle". Third, we extend the work by Dyreng *et al.* (2010) by providing a potential explanation (managerial ability) of managerial fixed effects on tax avoidance. Fourth, our paper also relates to the work of Demerjian *et al.* (2013). Along with Demerjian *et al.* (2013), we show that higher ability managers are associated with better accounting and tax-related decisions. Thus, our findings have important public policy implications.

Notes

1. Hanlon and Heitzman (2010, p. 137) define tax avoidance as the "reduction of explicit taxes" and 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." We use tax aggressiveness and aggressive tax avoidance interchangeable in this paper.
2. One exception is Chyz (2013) who finds that managers who are more likely to avoid personal taxes are also more likely to avoid corporate taxes.
3. In contrast, Desai and Dharmapala (2006) and Kim *et al.* (2011) argue that managers can use complex and obfuscated tax avoidance activities to mask and facilitate rent extraction and other self-serving actions, potentially leading to greater managerial opportunism.
4. For example, Dyreng, Lindsey, and Thornock (2013) find that the use of Delaware subsidiaries as domestic tax havens, on average, increases net income by 1.0–1.5%.
5. For example, GlaxoSmithKline PLC settled with the IRS for $3.4 billion in connection with transfer pricing practices that sought to avoid taxes. AstraZeneca PLC paid $1.1 billion to settle a similar dispute with the IRS in 2011. Merck and Co. settled several disputed tax issues including its use of minority equity interest financing transactions with the IRS in 2007 by paying a settlement of $2.3 billion, which included back taxes, penalties and interest.
6. Gallemore *et al.* (2014) do not find support for reputational effects playing a role either in executive or auditor turnover or in lost sales or media reputation. However, Graham *et al.* (2014) question the ability of the data and methodology used by Gallemore *et al.* (2014) to ascertain the importance of reputational impact of tax avoidance.
7. Please see Demerjian *et al.* (2012) for more details.
8. Hanlon and Heitzman (2010) discuss the usage and limitations of each tax avoidance measure in the literature in detail.
9. Data are available at: https://peterdemerjian.weebly.com/managerialability.html
10. To mitigate the influence of outliers, all control variables with continuous values are winsorized at the 1 and 99% levels.
11. Alternatively, we define the Dummy (low-to-high firms) equal to one if a firm's MA rank is below 0.5 each year for the pre-transition period and above 0.5 each year for the post-transition period, and it equals zero if a firm has MA rank below 0.5 each year for the pre-transition period and remains

below 0.5 each year for the post-transition period. All our results in the difference-in-difference analyses still hold.

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Appendix

Table A1.
Variable definition

Variable	Definition
ETR	Effective tax rate (ETR) is 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 zero or negative. Following prior studies, we winsorize ETR to the range [0, 1]
Dummy (ETR)	Equals one if a firm's industry adjusted ETR in a particular year is in the bottom quintile of the sample in that year
CET	Cash effective tax rate (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 zero or negative. Following prior studies, we winsorize CETR to the range [0, 1]
Dummy (CETR)	Equals one if a firm's industry adjusted CETR in a particular year is in the bottom quintile of the sample in that year
DTAX	DTAX is equal to firm i's residual from the following regression estimated by two-digit SIC code and fiscal year $PERMDIFF_{i,t} = \beta_0 + \beta_1 INTANG_{i,t} + \beta_2 UNCON_{i,t} + \beta_3 MI_{i,t} + \beta_4 CSTE_{i,t} + \beta_5 \Delta NOL_{i,t} + \beta_6 LAGPERM_{i,t} + \varepsilon_{i,t}$; Where: $PERMDIFF_{i,t} = BI_{i,t} - [(CFTE_{i,t} + CFOR_{i,t})/STR_{i,t}] - (DTE_{i,t}/STR_{i,t})$ $BI_{i,t}$ = pre-tax book income (PI) for firm i in year t $CFTE_{i,t}$ = current federal tax expense (TXFED) for firm i in year t $CFOR_{i,t}$ = current foreign tax expense (TXFO) for firm i in year t $DTE_{i,t}$ = deferred tax expense (TXDI) for firm i in year t $STR_{i,t}$ = statutory tax rate in year t $INTANG_{i,t}$ = goodwill and other intangibles (INTAN) for firm i in year t $UNCON_{i,t}$ = income (loss) reported under the equity method (ESUB) for firm i in year t $MI_{i,t}$ = income (loss) attributable to minority interest (MII) for firm i in year t $CSTE_{i,t}$ = current state income tax expense (TXS) for firm i in year t $\Delta NOL_{i,t}$ = change in net operating loss carryforwards (TLCF) for firm i in year t $LAGPERM_{i,t}$ = one-year lagged PERMDIFF for firm i in year t; and $\varepsilon_{i,t}$ = discretionary permanent difference ($DTAX_{i,t}$) for firm i in year t. We follow Frank *et al.* (2009) in addressing the missing value problems in estimating DTAX. 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 zero. 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 goodwill and other intangibles (INTAN) is missing on Compustat, then we set the value for INTANG to 0. If INTAN = C, then we set the value of INTANG to that for goodwill (GDWL). The variables in this regression model are winsorized at the 1 and 99% levels to mitigate the impact of extreme observations and possible data errors

(*continued*)

Table A1.

Variable	Definition
Tax shelter probability	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 is defined as above; |DAP| is the absolute value of discretionary accruals from the performance-adjusted modified cross-sectional Jones model; LEV is long-term debt divided by beginning of year total assets; SIZE is the log of total assets; ROE is pre-tax return on equity; foreign income is an indicator variable set equal to 1 for firm observations reporting foreign income and zero otherwise; R&D is R&D expense, divided by lagged total assets
Predicted UTB	Predicted uncertain tax positions. 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 $+ 0.001 \times$ MTB $+ 0.014 \times$ SG&A $- 0.018 \times$ SALE_GR, where PT_ROA is pre-tax return on assets; SIZE is the log of total assets; FOR_SALE is the ratio of foreign sales to total assets; R&D is research and development expense, scaled by beginning of year total assets; DISC_ACCR is discretionary accruals from the performance-adjusted modified cross-sectional Jones model; LEV is long-term debt divided by beginning of year total assets; MTB is market to book ratio; SG&A is selling, general and administrative expenses divided by beginning of year total assets; SALE_GR is three-year average sales growth rate
Tax haven	An indicator variable that equals one if a firm has at least one tax haven country subsidiary and zero otherwise. We obtain tax haven data from Scott Dyreng's personal webpage. Scott Dyreng provides data on the number of haven countries reported in firms' Exhibit 21 in their 10-K reports. Exhibit 21 is a required element of a firm's 10-K and includes a listing of all the firms subsidiaries with material operations. The tax haven countries are defined in Table 1 in Dyreng and Lindsay (2009)
MA score	A continuous score for managerial ability for each firm/year from Demerjian *et al.* (2012). The detail discussion of the measure can be found in Section 3.1
Size	The natural logarithm of the market value of equity (PRCC_$F \times$ CSHO)
M/B	The market-to-book ratio measured as the market value of equity (PRCC_$F \times$ CSHO) scaled by the book value of equity (CEQ)
Leverage	Leverage is measured as long-term debt (DLTT) scaled by lagged assets (AT)
Cash holding	The cash ratio measured as cash and short-term investments (CHE) scaled by lagged assets (AT)
NOL	A dummy variable coded as one if the loss carryforward (TLCF) is positive, and zero otherwise
Change NOL	The change in loss carryforward (TLCF) scaled by lagged assets (AT)
ROA	Return on assets, measured as operating income (PI $-$ XI) scaled by lagged assets (AT)
Foreign income	Foreign income (PIFO) scaled by lagged assets (AT)
Equity income	The equity income in earnings (ESUB) scaled by lagged assets (AT)
PPE	Property, plant and equipment (PPENT) scaled by lagged assets (AT)
Intangible assets	Intangible assets (INTAN) scaled by lagged assets (AT)