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Allison Koester, Terry Shevlin, Daniel Wangerin

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The Role of Managerial Ability in Corporate Tax Avoidance

Allison Koester
McDonough School of Business, Georgetown University, Washington, DC 20057, allison.koester@georgetown.edu

Terry Shevlin
Paul Merage School of Business, University of California, Irvine, Irvine, California 92697, tshevlin@uci.edu

Daniel Wangerin
Eli Broad College of Business, Michigan State University, East Lansing, Michigan 48824, wangerin@broad.msu.edu

Most prior studies model tax avoidance as a function of firm-level characteristics and do not consider how individual executive characteristics affect tax avoidance. This paper investigates whether executives with superior ability to efficiently manage corporate resources engage in greater tax avoidance. Our results show that moving from the lower to upper quartile of managerial ability is associated with a 3.15% (2.50%) reduction in a firm's one-year (five-year) cash effective tax rate. We examine how higher-ability managers reduce income tax payments and find that they engage in greater state tax planning activities, shift more income to foreign tax havens, make more research and development credit claims, and make greater investments in assets that generate accelerated depreciation deductions. Identifying a manager characteristic related to firms' tax policy decisions adds to our understanding of the factors that explain the substantial variation in corporate income tax payments across firms.

Keywords: tax avoidance; management style; managerial ability
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1. Introduction

This study examines the relation between executives' ability to efficiently manage corporate resources and corporate tax avoidance. Income tax payments range from 20% to 40% of pretax income for most U.S. public corporations (Dyreng et al. 2008), highlighting significant cross-sectional variation in tax planning activities across firms. As every dollar of taxes paid is a dollar that cannot be reinvested within the firm, we predict that executives with greater ability to efficiently manage resources make business decisions that reduce income tax payments. Our definition of executives includes all members of the executive team (e.g., chief executive officer (CEO), chief financial officer (CFO), chief operating officer, etc.). Our study is motivated by the Dyreng et al. (2010) finding that tax avoidance exhibits significant manager fixed effects. However, Dyreng et al. (2010) fail to find that observable manager characteristics (e.g., age, education, gender, tenure, etc.) explain the manager fixed effects, leading the authors to conclude that "the executive effects on tax avoidance appear to be idiosyncratic" (p. 1165). Our study sheds new light on the role of individual managers in corporate tax planning decisions.

We expect executives' ability to efficiently manage resources to be positively related to corporate tax avoidance for at least three reasons. First, higher-ability executives have a superior understanding of their firm's operating environment (Demerjian et al. 2012, 2013). This understanding enables a better alignment of business decisions with tax strategies, allowing these executives to more easily identify and exploit tax planning opportunities. Second, executives can create a "tone at the top" that emphasizes minimizing costs, and executives with greater ability to efficiently manage resources are presumably more capable of achieving their objectives. While incentives exist to reduce all types of costs, reducing cash outflows to taxing authorities is expected to be particularly appealing to executives that efficiently manage resources because reductions in tax payments do not have adverse effects on firm operations. For example, firms can cut costs by purchasing lower-quality materials, but this is likely to result in lower-quality products, which increases product returns and diminishes brand reputation. In contrast, firms that purchase high-quality materials can reduce costs through tax savings from favorable transfer pricing arrangements with no effect on product quality. Finally, while cash tax payments do not yield a firm-specific return, cash tax savings allocated to firm operations have the potential to generate a positive return on investment. Redirecting resources from tax payments to firm operations should be particularly appealing to executives with greater ability to efficiently manage firm resources.

However, there are several reasons why we may fail to find that higher-ability executives engage in greater tax avoidance. All else equal, all managers should want to pay the lowest amount of taxes legally permissible for a given level of income. However, not all managers have the same opportunities to achieve a lower tax rate. Many factors that influence tax avoidance, such as industry membership, location decisions, research and development (R&D) activities, etc., are the result of years of strategic decision making, and it may not be cost beneficial to change these factors simply to avoid additional taxes. There is also significant variation in the extent to which firms engage in tax-advantaged activities (e.g., foreign operations, R&D, etc.), and many firms do not engage in these activities at all. Prior research also shows that executive compensation incentives influence corporate tax avoidance policies (e.g., Rego and Wilson 2012, Armstrong et al. 2012, Gaertner 2014). If the majority of variation in tax avoidance is driven by the firm characteristics and compensation incentives identified in prior literature, there is little or no role for managerial ability to have a meaningful effect on corporate tax avoidance.

Even when strong incentives and opportunities to reduce taxes are present, there are several other reasons that managerial ability might not impact a firm's tax avoidance activities. Managers with the deepest understanding of their firm's operating environment may not have the technical tax knowledge needed to plan and implement tax avoidance strategies. While higher-ability managers could hire individuals or engage consultants possessing this expertise, the opportunity to hire experts is also available to lower-ability executives.[1] It is also possible that higher-ability executives are so focused on core business operations that the tax implications of operating decisions are not a first-order consideration. Ultimately, the nature of the relation between executives' ability to efficiently manage resources and corporate tax avoidance is an empirical question.

As executives' ability to efficiently manage resources is not directly observable, ability must be inferred from observable outcomes of executives' resource allocation decisions. We operationalize executive ability to manage resources efficiently using a measure developed in Demerjian et al. (2012). Intuitively, this measure captures how efficiently managers can convert firm resources (e.g., capital, labor, and intangible assets) into revenues relative to the firm's industry competitors; more efficient managers are able to generate greater output from a given set of inputs. The measure is constructed using a two-stage approach. The first stage uses data envelopment analysis (DEA) to capture how efficiently firm resources are managed to generate revenues relative to a firm's industry competitors, and the second stage isolates the portion of firm efficiency attributable to a firm's executive team. Demerjian et al. (2012) validate this measure as a proxy for managerial ability by showing that it is strongly associated with manager fixed effects and has superior ability to explain changes in future firm performance and stock market reactions to CEO turnovers relative to other managerial ability proxies used in the literature (e.g., historical firm performance, CEO media mentions, CEO tenure, etc.). Using the Demerjian et al. (2012) measure allows us to examine how a specific dimension of managerial ability—the ability to efficiently manage firm resources—is associated with corporate tax avoidance.

Our empirical results indicate that executives with greater ability to efficiently manage resources have an economically significant effect on corporate taxes. Moving from the lower to upper quartile of managerial ability is associated with a 3.15% (2.50%) reduction in a firm's one-year (five-year) cash effective tax rate (ETR).[2] Based on mean pretax income of $218 million in our sample, this translates to nearly $7 million in annual cash tax savings for the average firm.

Next, we build upon our main findings to shed light on how higher-ability managers reduce corporate income tax payments. We first conduct a small-sample exploratory analysis utilizing hand-collected data from firms' income tax footnote disclosures to identify tax planning strategies commonly used by higher-ability managers. We next conduct cross-sectional tests to examine the extent to which these findings generalize to all firms in our study. Our analyses show that higher-ability managers achieve lower cash ETRs by (1) reducing state income taxes, (2) reducing foreign income taxes through income shifting and transfer pricing, (3) making more R&D credit claims, and (4) investing in assets that generate accelerated depreciation deductions.

Finally, we explore cross-sectional variation in the relation between managerial ability and tax avoidance. We show that higher-ability managers reduce

[1] We note that a broad definition of managerial ability includes the ability to identify and hire better talent, suggesting that lower-ability managers are unable to hire individuals or consultants with as much expertise (e.g., Amit and Schoemaker 1993).

[2] We use a cash (as opposed to a generally accepted accounting principles (GAAP)) ETR measure because a cash ETR measure captures permanent and temporary tax deferral strategies, both of which retain cash resources within the firm. A GAAP ETR measure does not reflect cash savings from temporary tax deferral strategies and is affected by noncash accruals like changes in the valuation allowance, tax expense accrued for foreign earnings not considered permanently reinvested, changes in unrecognized tax benefits, etc.

tax payments to a greater degree when there is greater variation in opportunities for tax avoidance within their firms' industry (i.e., higher standard deviations in cash ETRs at the industry level), highlighting that ability and tax avoidance opportunities are complements. In contrast, we find that lower-ability managers respond more to equity compensation incentives for tax avoidance, suggesting that managerial ability and compensation incentives are substitutes.

Because tax planning opportunities are closely related to a firm's operating, investing, and financing decisions, and these decisions generate tax costs and benefits, we use a variety of econometric techniques to address whether managerial ability and income tax avoidance are endogenously related. First, measuring managerial ability within industry reduces variation in firms' operating, investing, and financing activities that relates to both firm efficiency and tax avoidance. Second, in the majority of our analyses we include both firm fixed effects and time-varying firm characteristics. The former controls for stationary firm characteristics and addresses unobservable heterogeneity by controlling for factors that are both (1) constant within a firm over time and (2) potentially correlated with a model's independent variable of interest. The latter controls for changes in firms' operating, investing, and financing activities that affect both managerial ability and tax avoidance activities. Third, we decompose the managerial ability measure into firm fixed effects and manager fixed effects, providing a strong identification strategy that isolates the effects of individual managers. Fourth, we explicitly control for firm resources provided by tax avoidance in the construction of the managerial ability measure to address concerns of a mechanical relation between ability and tax avoidance. Finally, to better isolate the impact of an individual manager on corporate tax avoidance, we also conduct difference-in-differences tests examining changes in tax avoidance surrounding CEO turnovers. Using a turnover event to isolate the CEO's effect on changes in managerial ability and tax avoidance allows for strong identification of an individual manager's effect and also helps to reduce the possibility that correlated omitted variables drive our main findings. Controlling for contemporaneous changes in firm characteristics, moving from the lower to upper quartile of managerial ability is associated with a 4.37% decline in cash ETRs during the three years following a CEO turnover relative to the three years before the turnover. Collectively, these additional controls and analyses lead us to believe that our inferences are not driven by endogeneity arising from correlated omitted variables related to firms' operating, investing, and financing activities.

Our study makes several contributions to the literature and has broad implications for research in accounting, finance, management, and strategy. Most prior studies model tax avoidance as a function of firm-level characteristics and fail to consider the influence of individual managers (see Hanlon and Heitzman 2010 for a review of this literature). Our study answers the call by Hanlon and Heitzman (2010) to further explore the "manager effect" on tax avoidance by explicitly considering the impact of individual corporate decision makers on corporate tax strategies. Our results highlight that executive ability to efficiently manage firm resources is an important manager characteristic that affects tax avoidance and shed light on several specific tax planning strategies used more effectively by higher-ability managers. We also contribute to the literature linking managerial ability to financial reporting quality (e.g., Baik et al. 2011, Demerjian et al. 2013, 2015) and other managerial decision-making outcomes (e.g., Jung et al. 2014, Bonsall et al. 2016). We find that managerial ability affects an important corporate outcome not considered in prior literature: income tax payments. Our findings should be of interest to board members when considering the costs and benefits of hiring executives, as well as to regulators, corporate stakeholders, and academics interested in understanding how individual decision makers affect corporate income tax avoidance.

Our study is subject to several limitations. First, as we are unable to observe managers' daily decision-making, we rely on financial statement information to infer managers' strategic choices. Second, some of the measures we use to capture how higher-ability managers avoid taxes (e.g., goodwill and changes in deferred tax assets and liabilities) are noisy proxies for their underlying constructs. Thus, some of the evidence we provide on the specific types of tax planning strategies used by higher-ability managers is indirect. Third, our tax avoidance measures fail to capture implicit taxes and nonconforming tax avoidance, both of which are important ways managers avoid corporate income tax (Jennings et al. 2012, Badertscher et al. 2015). Finally, it is possible that the managerial ability measure of Demerjian et al. (2012) captures some aspect of firms' operating, investing, and financing environment that we have not adequately controlled for in our tests.

2. Related Literature and Hypothesis Development

2.1. Tax Avoidance, Management Style, and Managerial Ability

Following Hanlon and Heitzman (2010), we broadly define tax avoidance as the reduction of explicit taxes.

Thus, tax avoidance includes the effects of tax savings from all activities in which the firm engages (e.g., real activities that are tax advantaged, identifying and capitalizing upon tax planning opportunities, and targeted tax benefits from lobbying and political connectedness). Hanlon and Heitzman (2010) note that most corporate tax avoidance research focuses on firm characteristics as determinants (e.g., Gupta and Newberry 1997, Mills 1998, Rego 2003, Wilson 2009, Lisowsky 2010) and identify research that considers the impact that individual corporate decision makers have on a firm's tax avoidance strategies as a gap in the tax literature.

A separate stream of research examines the effect of individual managers on corporate decisions. Bertrand and Schoar's (2003) study of managers' impact on corporate financial policy and investment decisions (e.g., dividends, capital expenditures, and mergers and acquisitions) serves as the foundational paper in what is referred to as the "management style" literature. The management style research design involves tracking individual managers who move across multiple firms over time and uses manager fixed effects to capture the influence of individual managers' unobservable characteristics on corporate decisions. A manager fixed effects research design has been used to examine managers' effect on voluntary disclosure decisions and earnings quality (Bamber et al. 2010, Ge et al. 2011, Dejong and Ling 2013). Dyreng et al. (2010) extend the management style framework to a tax setting and show a manager-specific effect on corporate tax avoidance using a manager fixed effects research design.

Demerjian et al. (2013) assess the impact of individual managers on earnings quality by replacing manager fixed effects with the measure of managerial ability from Demerjian et al. (2012). The authors show that managerial ability is positively (negatively) associated with accruals quality (restatements), suggesting that higher-ability managers are better able to make complex accounting judgments and estimates that reflect the underlying nature of their firms' transactions. We adopt this approach by modeling tax avoidance and replacing manager fixed effects with the Demerjian et al. (2012) measure that captures executives' ability to manage resources efficiently. Relative to a manager fixed effects research design, our research design allows us to examine an identifiable manager characteristic, develop and test a directional hypothesis, and generalize our inferences beyond the small subsample of observations where managers move across firms over time.

Our research design also allows us to avoid the econometric concerns of a manager fixed effects research design highlighted by Fee et al. (2013). The authors explain that a test of joint significance of manager fixed effect coefficients could be econometrically invalid in detecting the presence of significant individual management style effects. Their concern arises because standard asymptotic theory does not apply to tests where variables are highly serially correlated and the properties of standard F-tests for joint significance are unknown (Wooldridge 2002). Fee et al. (2013) demonstrate this econometric concern by randomly assigning CEO-to-CEO movers to different hiring firms than the ones they actually joined and finding that F-tests erroneously reveal highly significant manager fixed effects.

2.2. Hypothesis Development

We predict that, all else equal, executives with greater ability to manage resources efficiently will engage in greater tax avoidance. This prediction is based on three arguments. First, higher-ability managers can better align business decisions with tax strategies and more easily identify and exploit tax planning opportunities due to their superior understanding of their firm's operating environment. For example, the timing, classification, and location of R&D activities have important implications for obtaining tax benefits through R&D tax credits, and M&A transactions can be structured in ways that generate significant tax costs or benefits. Second, higher-ability executives can set a "tone at the top" emphasizing cost minimization. While all managers face incentives to reduce costs, executives with greater ability to efficiently manage firm resources are likely more capable of achieving significant cost reductions. Although all managers have incentives to reduce all types of costs, reducing operating costs (e.g., marketing, production, labor, etc.) can have adverse consequences on firm operations. For example, cuts to marketing can reduce sales and cuts to R&D spending and employee wages can hamper innovation. In contrast, reducing tax costs does not have direct adverse effects on firm operations. Therefore, we expect executives savvy in managing resources efficiently to find cost reductions through tax avoidance particularly appealing. Finally, executives who efficiently manage their firm's resources are expected to make business decisions that reduce income tax cash outflows because every dollar of taxes paid is a dollar that cannot be reinvested within the firm. Whereas cash tax payments do not yield a firm-specific return, cash tax savings can be allocated to firm operations with the potential to generate a positive return on investment. Redirecting firm resources to operating activities is expected to be particularly appealing to executives with greater ability to efficiently manage firm resources.

On the other hand, there are several reasons that higher-ability executives may not avoid more income tax than their lower-ability industry peers. Ceteris paribus, all managers have incentives to maximize after-tax profits by reducing income taxes, but not all have the same opportunities to avoid taxes. Many factors that influence tax avoidance are explained by firm characteristics that result from managers' prior strategic decisions (e.g., Hanlon and Heitzman 2010). It may not be cost beneficial for managers to make new strategic decisions that change the industry mix of the business, move operations, alter R&D strategies, etc., simply to avoid additional taxes. For example, firms often establish overseas operations to lower production costs or be located closer to suppliers and customers. Some foreign operations allow U.S. firms to pay a lower tax rate on foreign-source income and engage in advantageous transfer pricing. It may not be cost beneficial for firms without extensive foreign manufacturing, suppliers, or customers to establish a foreign location simply to avoid taxes. Prior research also shows that incentive compensation influences tax avoidance (e.g., Rego and Wilson 2012). If the majority of variation in tax avoidance is driven by innate firm characteristics and compensation incentives, there is little or no role for managerial ability to have a significant effect on firms' tax avoidance policies.

In addition, the skills necessary to manage resources efficiently could also be distinct from the specialized training and expertise required to identify and implement tax avoidance strategies, and all executives can hire individuals or engage consultants possessing tax expertise (although higher-abilty executives could identify and hire higher-quality experts). It is possible that higher-ability executives are so focused on core business operations that the tax implications of their operating decisions are not a first-order concern. Finally, the direct and indirect costs of tax avoidance may not outweigh the benefits. Direct costs include allocating firm resources to tax planning such as staffing an in-house tax department, implementing tax information systems, moving the physical location of operations, paying outside consultants, and lobbying for tax advantages (e.g., Mills et al. 1998, Lynch 2014, Brown et al. 2015). Indirect costs include political costs, reputation concerns, financial reporting effects, and increased IRS and financial statement auditor scrutiny (e.g., Zimmerman 1983, Graham et al. 2014, Mills 1998, Frank et al. 2009, Hoopes et al. 2012). Thus, the relation between executives' ability to manage resources efficiently and tax avoidance is an empirical question.

3. Research Design

We modify the manager fixed effects research design used in the management style literature where the dependent variable of interest is regressed on a set of firm characteristics and year, firm, and manager fixed effects (Bertrand and Schoar 2003, Bamber et al. 2010, Dyreng et al. 2010, Ge et al. 2011). Year fixed effects capture the average impact of unobservable time-variant economy-wide characteristics on the dependent variable, and firm (manager) fixed effects capture the average impact of unobservable time-invariant characteristics of the firm (manager). We modify this research design by replacing manager fixed effects with the Demerjian et al. (2012) managerial ability measure *MASCORE*:

$$CASHETR_{it} = \alpha_0 + \beta_1 MASCORE_{it} + Controls_{it} + YearFixedEffects + FirmFixedEffects + \varepsilon_{it}. \qquad (1)$$

In Equation (1), we predict that β_1 will be negative, consistent with executives possessing greater ability to manage resources efficiently engaging in greater tax avoidance. Variables are defined in detail below, and standard errors are two-way clustered by firm and year.

3.1. Dependent Variables

Our primary dependent variable of interest, denoted *CASHETR*, is firm i's cash ETR in year t. There are a wide range of proxies used to capture tax avoidance, and Hanlon and Heitzman (2010) advise researchers to select the proxy most appropriate for their research question of interest. While Dyreng et al. (2010) examine the impact of manager fixed effects on both cash and GAAP ETRs, we focus on the cash ETR because this measure reflects permanent and temporary tax deferral strategies, both of which retain cash resources within the firm. In contrast, GAAP ETRs do not reflect temporary tax savings from timing differences like accelerated depreciation, uncertain tax positions, and foreign earnings not designated as permanently reinvested, as well as potential future tax savings that a firm has offset with a valuation allowance.

CASHETR is measured as cash taxes paid as a percentage of pretax book income before special items (Dyreng et al. 2008). Consistent with prior literature, we require observations to have positive cash taxes paid and positive pretax book income before special items, and we reset *CASHETR* values greater than one to one (Dyreng et al. 2010). We use a one-year cash ETR measure because *MASCORE* is constructed at the firm-year level. Dyreng et al. (2008) note that one-year cash ETRs are not strong predictors of long-run cash ETRs, suggesting that a one-year measure can be a noisy proxy for long-run corporate tax avoidance. While some of this concern is alleviated by Dyreng et al. (2008) finding that low one-year cash ETRs are more persistent than high one-year cash ETRs, we also use three-year and five-year cash ETRs. *CASHETR3* (*CASHETR5*) is defined as the sum of cash taxes paid in years t through $t+2$ $(t+4)$

divided by the sum of pretax income before special items in years t through $t+2$ ($t+4$). We require the sum of cash taxes paid (the numerator) and pretax income before special items (the denominator) to be positive over these three- and five-year windows, and ratio values greater than one are reset to one. When *CASHETR3* (*CASHETR5*) is our dependent variable, we average *MASCORE* and control variables over years t through $t+2$ ($t+4$).

3.2. Test Variable

We use the variable *MASCORE* developed in Demerjian et al. (2012) to capture executives' ability to manage firm resources efficiently.[3] The intuition underlying this measure is based on how efficiently managers can convert firm resources (e.g., capital, labor, and intangible assets) into revenues relative to the firm's industry competitors; more efficient managers are able to generate higher output from a given set of inputs. Demerjian et al. (2012) use data envelopment analysis (DEA) to estimate firm efficiency by forming an efficient frontier from the level and mix of inputs used to generate output.[4] The authors employ DEA by comparing the sales revenue generated by each firm conditional on a vector of inputs including cost of goods sold; selling, general, and administrative expenses (SG&A expenses); net plant, property, and equipment (PP&E); operating leases; R&D, goodwill, and other intangibles. The DEA procedure solves the following optimization problem at the industry-year level (where industry is defined using the Fama–French 48 classifications (Fama and French 1997)):

$$\max_{v} \theta_t = (Sales_t)\cdot(v_1 COGS_t + v_2 SG\&A_t + v_3 PPE_t + v_4 OpsLease_t + v_5 R\&D_t + v_6 Goodwill_t + v_7 OtherIntan_t)^{-1}. \tag{2a}$$

The DEA optimization determines a firm-specific vector of optimal weights on the seven input variables by comparing the inputs of firm i to the inputs of all other firms within the same industry-year and computes a firm efficiency score θ that takes a value between 0 (for the least efficient firms) and 1 (for the most efficient firms). Demerjian et al. (2012) require a minimum of 100 firm-year observations to estimate Equation (2a) to avoid a large percentage of firms being on the efficient frontier when there are too few observations.

To isolate the portion of the efficiency score attributable to the managerial team, Demerjian et al. (2012) then estimate cross-sectional regressions by industry, regressing each firm-year efficiency score on firm-level characteristics expected to aid or hinder executives' ability to manage resources efficiently, as shown below in Equation (2b).

$$\theta_{it} = \alpha_0 + \beta_1 \ln(TotalAssets_{it}) + \beta_2 MarketShare_{it} + \beta_3 PositiveFreeCashFlow_{it} + \beta_4 \ln(Age_{it}) + \beta_5 BusinessSegmentConcentration_{it} + \beta_6 ForeignCurrencyIndicator_{it} + YearFixedEffects + \varepsilon_{it}. \tag{2b}$$

Firm size, market share, positive free cash flow, and firm age are expected to aid management in creating an efficient operating environment, while complex multisegment and international operations are predicted to have a negative impact on firm efficiency. *MASCORE* is constructed using the unexplained portion of θ (e.g., the information in the residuals) and represents managers' ability to manage resources efficiently relative to their industry peers.[5]

Demerjian et al. (2012) validate *MASCORE* in multiple ways. First, they demonstrate through a battery of tests that the measure is superior to other proxies for managerial ability used in prior literature (e.g., historical stock returns, accounting-based performance, and CEO media citations). Second, they show a positive stock market reaction to CEO turnover announcements when a higher-ability CEO replaces a lower-ability CEO (and a negative stock market reaction when the new CEO has lower ability). Finally, the authors find that hiring a CEO with higher (lower) ability than the firm's former CEO is associated with improvements (declines) in future firm performance. Unlike other measures of managerial ability used in prior literature (e.g., longer CEO tenure, higher CEO pay, higher historical stock and accounting performance, more CEO media mentions, etc.), *MASCORE* is the only managerial ability measure that captures

[3] *MASCORE* data are obtained directly from Peter Demerjian's website: http://faculty.washington.edu/pdemerj/data.html.

[4] DEA offers two key econometric advantages over other estimation procedures. First, DEA provides an ordinal ranking of firms' relative efficiency as compared to a Pareto-efficient frontier (i.e., the best performance that can be achieved). This means that DEA allows different firms to optimize across different input–output combinations and compares each firm to the most efficient outcome. In contrast, parametric methods like ordinary least squares (OLS) and ratio analysis estimate efficiency relative to average performance, which yields a fundamentally different efficiency ranking. Second, simple ratio-based efficiency measures such as return on assets place an equal weight on each input, while DEA calculates efficiency weights using all possible combinations of inputs. DEA is commonly used in many disciplines to measure efficiency at the firm and manager levels (e.g., Thore et al. 1994, Murthi et al. 1996, Barr and Siems 1997, Leverty and Grace 2012).

[5] See Appendix A of Demerjian et al. (2013) for additional information regarding Equations (2a) and (2b).

executives' ability to manage resources efficiency (our construct of interest).[6]

Specific to our setting, there are several important features related to the construction of *MASCORE* worth noting. First, the variables used to capture inputs and output in Equation (2a) are measured in pretax dollars, helping to mitigate concerns that firm efficiency and tax avoidance are mechanically related. Second, we want to ensure that our findings are not attributable to firms reaching the efficient frontier in part due to tax avoidance, as resources retained due to tax avoidance could represent a potential correlated omitted variable in Equation (2b).[7] We note that some firm characteristics included in Equation (2b) partially control for tax avoidance. For example, firm size controls for resources available for tax planning, and the foreign currency indicator controls for the presence of foreign operations (e.g., Rego 2003, De Simone et al. 2014). Because *MASCORE* is the residual from estimating Equation (2b), it is orthogonal to these firm-level characteristics, helping to further mitigate concerns that *MASCORE* and tax avoidance are mechanically related. Finally, *MASCORE* may capture unspecified firm characteristics rather than a manager effect. To address this possibility, we conduct additional tests using CEO turnovers and manager fixed effects to isolate the impact of individual managers on *MASCORE*. Although these tests are necessarily conducted within limited subsamples, they provide stronger identification strategies to isolate the effect of individual managers on tax avoidance.

3.3. Control Variables

We include firm characteristics known to be associated with tax avoidance as control variables in Equation (1) to reduce the possibility that *MASCORE* is capturing the effect of these characteristics on tax avoidance. Following Dyreng et al. (2010), we control for research and development expense (*RD*), advertising expense (*AD*), capital expenditures (*CAPX*), leverage (*LEV*), foreign operations (*FOREIGN*), firm size (*SIZE*), and intangible assets (*INTANG*).[8] Prior research generally finds that cash ETRs are decreasing in *RD*, *CAPX*, *LEV*, *FOREIGN*, and *INTANG*, and increasing in *AD* (e.g., Chen et al. 2010, Dyreng et al. 2010, Rego and Wilson 2012). We also include a variable that captures net operating loss (NOL) utilization (*NOL_DECREASE*) and predict a negative relation between this variable and cash ETRs. All variables are defined in the appendix and all continuous variables are winsorized at the 1st and 99th percentiles. Including year fixed effects in Equation (1) eliminates the possibility that *MASCORE* picks up the effects of macroeconomic characteristics that affect all firms in a particular year. Including firm fixed effects in Equation (1) reduces the likelihood that *MASCORE* captures stationary firm characteristics and eliminates the concern that stationary firm attributes affecting both tax avoidance and *MASCORE* are not adequately controlled for in Equation (2b). Thus, the *MASCORE* coefficient captures the relation between corporate tax avoidance and managerial ability using firm-specific variation over time.

4. Primary Findings

4.1. Sample and Summary Statistics

We begin our analysis in 1994 to allow for the adoption of SFAS 109 (i.e., a consistent financial reporting regime for income taxes) and end our analysis in 2010 because this is the latest year the *MASCORE* data are available at the time of our study. We require firm-year observations to have nonmissing values for the Equation (1) variables, yielding a sample of 44,616 firm-year observations that are approximately evenly distributed across our 17-year time period.

Table 1 reports descriptive statistics for our regression variables. The distributions of *CASHETR* and control variables are comparable with descriptive statistics reported in prior studies (e.g., Dyreng et al. 2010, Edwards et al. 2016). The mean *CASHETR* value is 27.5%, with an interquartile range of 8.8%–36.9%. Consistent with Dyreng et al. (2008), values

[6] For example, longer CEO tenure has been interpreted as evidence of entrenched management (Hermalin and Weisbach 1998); higher CEO pay can reflect rent extraction (Core et al. 1999), higher historical stock and accounting performance does not distinguish between firm and manager effects, and more CEO media mentions do not distinguish between firm and manager effects and could reflect negative events.

[7] We note that not all firms will necessarily utilize cash tax savings efficiently. The agency cost of free cash flow theory predicts that firms with greater free cash flow are more likely to invest excess cash inefficiently (Jensen 1986). Therefore, it is possible that tax avoidance could move firms away from the efficient frontier, which would bias against our predictions.

[8] Dyreng et al. (2010) include three additional control variables that we omit: selling, general, and administrative expenses (SG&A), plant, property, and equipment (PP&E), and stock option exercises. We omit SG&A because advertising expense is a component of SG&A and advertising expense better captures the nontax costs of tax avoidance (Hanlon and Slemrod 2009). We omit PP&E because CAPX better captures the impact of depreciation deductions on a firm's cash ETR. While Dyreng et al. (2010) control for stock option exercises, this variable is only available for Execucomp firms through 2006, which eliminates 77% of firm-year observations in our sample. In a robustness test, we confirm that our results are not sensitive to controlling for stock option exercises (see Section 6.1.5). We also note that, while Dyreng et al. (2010) define R&D as research and development expenditures scaled by sales, we define R&D as the natural log of one plus research and development expenditures due to a highly skewed distribution. We continue to find that higher-ability managers engage in greater tax avoidance when we include SG&A and PP&E as control variables and scale R&D expenditures by sales (untabulated).

Table 1 Descriptive Statistics

	N	Mean	P50	SD	P25	P75
			Dependent variables			
CASHETR	44,616	0.2751	0.2402	0.2434	0.0881	0.3694
*CASHETR*3	34,232	0.2891	0.2622	0.2517	0.1124	0.3669
*CASHETR*5	22,630	0.3415	0.2918	0.2889	0.1577	0.3925
Δ*CASHETR*3	808	−0.0346	−0.0150	0.2923	−0.1163	0.0767
			Independent variables of interest			
MASCORE	44,616	0.0300	0.0169	0.1397	−0.0600	0.1072
Δ*MASCORE*3	808	−0.0202	−0.0269	0.2672	−0.1562	0.1356
			Control variables			
RD	44,616	1.1595	0.0000	1.7463	0.0000	2.0857
AD	44,616	0.0090	0.0000	0.0231	0.0000	0.0050
CAPX	44,616	0.1471	0.1093	0.1223	0.0656	0.1877
LEV	44,616	0.1709	0.1241	0.1822	0.0047	0.2764
FOREIGN	44,616	0.3759	0.0000	0.4844	0.0000	1.0000
SIZE	44,616	5.6843	5.6268	2.0158	4.2489	7.0498
INTANG	44,616	0.1410	0.0666	0.1745	0.0007	0.2226
NOL_DECREASE	44,616	0.1594	0.0000	0.3660	0.0000	0.0000

Notes. This table reports descriptive statistics for our regression variables. All variables are defined in the appendix and all continuous variables are winsorized at the 1st and 99th percentiles (pooled).

for our long-run cash ETR measures (*CASHETR3* and *CASHETR5*) are higher than our one-year measure. Our sample firms are smaller (SIZE) than those in Dyreng et al. (2010) because we use firms from the Compustat universe while Dyreng et al. (2010) limit their analysis to Execucomp firms.

The mean *MASCORE* value is 0.03 with an interquartile range of −0.06 to 0.11. These values are slightly higher than those reported in Demerjian et al. (2012). This difference is attributable to eliminating observations from our sample with negative pretax income before special items to calculate *CASHETR*, resulting in our sample firms being more profitable. The standard deviation of *MASCORE* in our sample is comparable to Demerjian et al. (2012), suggesting that *MASCORE* values are distributed similarly within our sample. Untabulated analyses reveal that *MASCORE* values are fairly stable from year to year: the Pearson correlation between $MASCORE_{t-1}$ and $MASCORE_t$ is 0.80 ($p < 0.01$), and the mean one-year change is −0.004. However, *MASCORE* exhibits significant within-firm variation over longer time periods: the average firm-specific standard deviation of *MASCORE* is 0.07 (untabulated). *MASCORE* values at firm i can vary over time for a number of reasons. For example, the same set of managers can change how they respond to macroeconomic conditions that affect their firm. In addition, changes in a firm's competitive environment can affect demand for its products, which can trigger changes in the ways managers deploy resources. Finally, changes in the composition of executive teams within a firm can also affect *MASCORE*. A change in the executive team is particularly important in our setting because it allows us to empirically isolate the effect of individual executives on changes in firms' tax avoidance activities.

Table 2 presents Pearson correlations. We find a negative correlation between *MASCORE* and *CASHETR*, *CASHETR3*, and *CASHETR5* ($p < 0.01$), consistent with our prediction that executives with greater ability to manage firm resources engage in more tax avoidance.[9] The majority of the control variables exhibit significant correlations with our tax avoidance proxies, highlighting the importance of controlling for these factors in our multivariate tests.

4.2. Main Analysis

Table 3 presents the results from estimating Equation (1). In column (1) of panel A we present the results from a baseline model that regresses *CASHETR* on a set of firm characteristics and year fixed effects. Most of the coefficients are significant in the predicted direction: *CASHETR* is decreasing in research and development expenses (*RD*), capital expenditures (*CAPX*), leverage (*LEV*), and NOL utilization (*NOL_DECREASE*) and increasing in advertising expense (*AD*). While we predict a negative relation between *CASHETR* and both *FOREIGN* and *INTANG*, the coefficients are positive and significant in column (1). Untabulated analyses reveal that the positive relation between *CASHETR* and *FOREIGN* is driven by firm-years with foreign current effective tax rates greater than the U.S. statutory tax rate.[10] We note that

[9] Consistent with our multivariate tests of long-run cash ETRs, we sum *MASCORE* over the three-year (five-year) period corresponding to *CASHETR3* (*CASHETR5*) and report these pairwise correlations in Table 2.

[10] Specifically, we compare firms' foreign current ETR to the 35% U.S. federal statutory tax rate. Of the 16,027 firm-years with a nonmissing foreign current ETR, 54.3% have a foreign current ETR that is greater than the U.S. federal statutory tax rate. When we

Table 2 Pairwise Correlations

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
[1] *CASHETR*											
[2] *CASHETR3*	*0.5686*										
[3] *CASHETR5*	*0.4246*	*0.6927*									
[4] *MASCORE*	*−0.0300*	*−0.0125*	*−0.0203*								
[5] *RD*	*−0.0238*	*−0.0211*	*−0.0277*	*−0.0273*							
[6] *AD*	*0.0188*	*0.0089*	*−0.0044*	*0.0181*	*0.0355*						
[7] *CAPX*	*−0.0256*	*−0.0348*	*−0.0304*	*0.2259*	*−0.0321*	*0.0380*					
[8] *LEV*	*−0.0110*	*−0.0151*	*−0.0119*	*−0.0917*	*−0.1057*	0.0001	*−0.1425*				
[9] *FOREIGN*	*0.0445*	*0.0381*	*0.0295*	*−0.0549*	*0.4565*	*0.0346*	*−0.1190*	*−0.0197*			
[10] *SIZE*	*0.0508*	*0.0643*	*0.0474*	*−0.0516*	*0.3900*	*0.0670*	*−0.1410*	*0.2635*	*0.3813*		
[11] *INTANG*	*0.0330*	*0.0168*	*−0.0186*	*−0.0248*	*0.1190*	*0.0832*	*−0.0765*	*0.2318*	*0.1376*	*0.2757*	
[12] *NOL_DECREASE*	*−0.1117*	*−0.1093*	*−0.1026*	−0.0043	*0.0548*	0.0073	*−0.0428*	−0.0030	*0.0727*	*−0.0178*	*0.0574*

Notes. This table reports Pearson product–moment correlations. Correlation coefficients in italics are significant at the 10% level or better using two-tailed p-values. All variables are defined in the appendix and all continuous variables are winsorized at the 1st and 99th percentiles (pooled).

one limitation of *INTANG* is that it does not capture internally generated intangible assets commonly used in income shifting tax planning strategies (e.g., Dyreng et al. 2013), and that some prior research finds a positive relation between *INTANG* and cash ETRs (e.g., Chen et al. 2010).

We add *MASCORE* to this baseline model in column (2) of panel A of Table 3 and find that the *MASCORE* coefficient is negative and highly significant ($p < 0.01$), consistent with our prediction that executives possessing higher ability to efficiently manage firm resources engage in more tax avoidance relative to their lower-ability peers. The magnitude and significance of the coefficients on the firm characteristics are similar to those in column (1). To separate the effects of firm and manager characteristics, we add firm fixed effects to the model in column (3) and find that the *MASCORE* coefficient remains negative ($p < 0.01$). Using the coefficient estimates presented in column (3) and holding all else equal, moving from the lower to upper quartile of managerial ability is associated with a 3.15% reduction in a firm's one-year cash ETR (untabulated).

Many of the coefficients on the time-varying firm characteristics become insignificant, and the magnitude of the coefficients that remain significant become smaller in column (3) relative to column (2) of panel A of Table 3. These results imply, not surprisingly, that cross-sectional variation is larger than time-series variation in the firm characteristics. Fixed effects are designed to exploit within-group variation over time and control for unobservable heterogeneity across firms related to factors that are (1) constant within a firm over time and (2) potentially correlated with a model's independent variables. When firm fixed effects are included in a regression, the coefficients capture the on-average relation between the dependent and independent variables within each firm over time. Without the inclusion of firm fixed effects, the coefficients also reflect cross-sectional variation between firms. For example, prior research that does not control for firm fixed effects finds that greater R&D is associated with lower ETRs (e.g., Mills et al. 1998, Rego 2003, Rego and Wilson 2012). The results in columns (2) and (3) show that it is variation in R&D across firms that generates the negative R&D coefficient generally observed in the literature, not variation in R&D within a firm over time. More generally, including firm fixed effects removes the cross-firm variation in each variable, meaning identification of an association between *CASHETR* and the independent variables is due to variation in the firm characteristics across time. The adjusted R^2 in column (3) increases from 3.84% to 24.80% relative to column (2), highlighting that stationary characteristics that vary across firms explain a significant portion of tax avoidance. Replacing firm fixed effects with industry fixed effects yields coefficient signs and magnitudes similar to those reported in column (2) (untabulated), further highlighting the impact of firm fixed effects.

In panel B of Table 3 we reestimate Equation (1) using cash ETRs measured over longer time periods. Column (1) presents our analyses using a three-year cash ETR (*CASHETR3*) as the dependent variable. Column (2) presents the results from repeating this analysis using a five-year cash ETR calculated over the period from t through $t+4$ (*CASHETR5*) and measuring *MASCORE* and all control variables over the same five-year window. We continue to find a negative coefficient on *MASCORE* using both measures ($p < 0.05$ in column (1) and $p < 0.01$ in column (2)), consistent with higher-ability managers engaging in tax avoidance strategies that reduce cash tax payments over the long run.[11] We also continue

estimate Equation (1) after including an indicator variable set equal to one for these firm-year observations, the coefficient on the indicator variable is positive ($p < 0.01$), and the *FOREIGN* coefficient becomes insignificant ($p > 0.10$).

[11] In untabulated tests we employ a scaled industry-year rank of *MASCORE* and find that it is negatively and significantly associated

Table 3 Relation Between Tax Avoidance and Managerial Ability

Panel A: One-year measure of *CASHETR*

		(1) Baseline model with controls for tax avoidance and year fixed effects		(2) Including *MASCORE*		(3) Including *MASCORE* and firm fixed effects	
Dependent variable: *CASHETR*	Pred. sign	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
MASCORE	−			**−0.0450*****	**−3.88**	**−0.1884*****	**−11.84**
RD	−	−0.0109***	−8.75	−0.0109***	−8.81	0.0040	1.21
AD	+	0.2294***	3.25	0.2318***	3.28	0.1541	1.13
CAPX	−	−0.0891***	−8.50	−0.0781***	−7.92	0.0615***	3.34
LEV	−	−0.0821***	−7.42	−0.0844***	−7.59	0.0236*	1.70
FOREIGN	−	0.0312***	7.20	0.0308***	7.14	0.0113*	1.93
SIZE	?	0.0093***	6.16	0.0093***	6.21	0.0260***	6.90
INTANG	−	0.0698***	4.09	0.0699***	4.04	−0.0086	−0.38
NOL_DECREASE	−	−0.0687***	−13.29	−0.0687***	−13.27	−0.0476***	−10.24
Fixed effects		Year		Year		Firm and year	
Standard errors clustered by		Firm and year		Firm and year		Firm and year	
Adjusted R^2		0.0378		0.0384		0.2480	
N		44,616		44,616		44,616	

Panel B: Long-run measures of *CASHETR*

		(1) $Y = CASHETR3$		(2) $Y = CASHETR5$	
	Pred. sign	Coeff.	*t*-stat.	Coeff.	*t*-stat.
MASCORE	−	**−0.0717****	**−2.28**	**−0.1780*****	**−3.06**
RD	−	−0.0124**	−2.22	−0.0090	−1.02
AD	+	0.0962	0.40	0.4433	1.19
CAPX	−	−0.0587*	−1.74	−0.0809	−1.11
LEV	−	−0.0353*	−1.61	0.0230	0.53
FOREIGN	−	0.0078	0.75	0.0006	0.03
SIZE	?	0.0264***	4.49	0.0016	0.13
INTANG	−	0.0079	0.31	−0.0355	−0.83
NOL_DECREASE	−	−0.0548***	−6.08	−0.0315*	−1.45
Fixed effects		Firm and year		Firm and year	
Standard errors clustered by		Firm and year		Firm and year	
Adjusted R^2		0.3713		0.4874	
N		34,232		22,630	

Notes. This table presents the results from estimating OLS regressions where the dependent variable is the cash ETR. In panel A, we use a one-year measure of *CASHETR* and long-run measures in panel B. In column (1) (column (2)) of panel B, the dependent and independent variables have been averaged over the time period t through $t+2$ (t through $t+4$) so the dependent and independent variables are measured contemporaneously. All variables are defined in the appendix and all continuous variables are winsorized at the 1st and 99th percentiles (pooled). Standard errors are adjusted for heteroskedasticity and two-way clustered by firm and year.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively; two-tailed (one-tailed) p-values are used for unsigned (directional) predictions. Coefficients and t-statistics of interest are in bold.

to find that managerial ability has an economically significant effect on tax avoidance. Using the coefficient estimates presented in column (1) (column (2)) and holding all else equal, moving from the lower to upper quartile of managerial ability is associated with a 1.07% (2.50%) reduction in a firm's three-year (five-year) cash ETR.[12] We note that the *AD*, *FOREIGN*, and *INTANG* control variable coefficients are insignificant in column (1), and all control variables excluding *NOL_DECREASE* are insignificant in column (2).

5. Tax Avoidance Mechanisms Used by Higher-Ability Managers

5.1. Small-Sample Exploratory Analysis

We next explore how higher-ability managers avoid taxes relative to their lower-ability industry peers. Our analysis is exploratory because we are unaware

with the one-, three-, and five-year *CASHETR*. Using industry-year ranks ensures that our results are not attributable to industries with greater variation in *MASCORE*.

[12] Our findings are robust to using a GAAP ETR measure as the dependent variable in Table 3 (untabulated). Using a one-year GAAP ETR yields a *MASCORE* coefficient of −0.30 ($p < 0.05$), while three-year and five-year GAAP ETRs yield *MASCORE* coefficients of −0.12 ($p < 0.01$) and −0.16 ($p < 0.01$), respectively.

of theory or any prior literature that provides clear ex ante predictions regarding which methods higher-ability managers use to avoid income tax. To provide insights about the specific income tax avoidance strategies these managers employ, we identify a small sample of observations and hand-collect data from two disclosures within firms' income tax footnotes. The income tax rate reconciliation schedule quantifies the effects of permanent differences between financial reporting income and taxable income, and the deferred tax asset (DTA) and deferred tax liability (DTL) roll-forward schedule identifies the sources of temporary differences. Hand-collection using a small sample is necessary because these data are not machine readable. We hold the industry composition of this subsample constant and select observations with relatively high or low values of *MASCORE* and *CASHETR* to identify meaningful differences in the income tax rate reconciliation and DTA/DTL schedules. Specifically, we select observations in the top and bottom quartiles of *CASHETR* and *MASCORE*. To avoid selecting observations with extreme values, we rank observations by industry within each *CASHETR*/*MASCORE* quartile and select observations closest to the 25th and 75th percentiles. In doing so, we create one group of observations with low cash ETRs and high managerial ability and another group with high cash ETRs and low managerial ability. We select 20 observations in each group from the three most heavily represented industries in our sample: business services, electronics, and retail. This procedure yields 120 firm-year observations (60 per group).

Summary statistics on the hand-collected data from these firms' income tax footnotes are presented in Table 4. Panel A presents descriptive statistics for our sample selection criteria by group. By construction, there are significant differences between *CASHETR* and *MASCORE* between the low-tax high-ability group versus the high-tax low-ability group ($p < 0.01$). Income tax rate reconciliation data are presented in panel B. Reconciling items that increase (decrease) a firm's effective tax rate are listed as positive (negative) values to reflect their effect on the book–tax gap and are shown as percentages. Because changes in DTAs and DTLs affect the current period cash ETR, we present the change in DTAs and DTLs from $t-1$ to t, scaled by pretax book income, in panel C. In each of the three panels, column (1) (column (2)) reports values for the low-tax high-ability (high-tax low-ability) group. Column (3) (column (4)) reports t-statistics for tests of mean differences (z-statistics for nonparametric Wilcoxon rank-sum tests of differences) between these two groups.

Panel B of Table 4 shows that higher-ability managers achieve lower cash ETRs by paying lower state income taxes, taking larger R&D tax credits, and structuring M&A transactions in tax-advantaged ways ($p < 0.10$ or better).[13] Panel C also indicates that higher-ability managers reduce tax payments through M&A transactions, depreciation, NOLs and other carry-forwards, and reserves, all of which allow higher-ability managers to defer income tax payments to a future date ($p < 0.10$ or better).[14] We use the descriptive evidence from this exploratory analysis to motivate and inform larger-sample tests investigating the extent to which these results generalize to our full sample. In our larger-sample tests we use a number of proxies to capture the types of tax planning strategies identified in our small-sample analyses in Table 4.[15]

5.2. Large Sample Evidence

We conduct four sets of analyses using our full sample of firm-year observations.

5.2.1. State and Foreign Tax Avoidance. Given that we find differences in state income tax avoidance between the two groups in our small-sample analyses tabulated in panel B of Table 4, we consider whether this relation extends more broadly across the entire sample. Although foreign income tax avoidance does not differ statistically between the two groups, the difference is in the predicted direction. Therefore, we also examine foreign income tax avoidance in our larger-sample tests. We decompose firms' worldwide GAAP-based current ETRs into their state and foreign components because disclosure limitations prevent us from observing a cash-based ETR for these tests. We focus on firms' current tax expense because it approximates cash taxes paid. *STATE_CETR* (*FOREIGN_CETR*) is defined as current state (foreign) income tax expense scaled by pretax

[13] Panel B of Table 4 also shows that unrecognized tax benefits (UTBs) are significantly different between the two groups. While a large negative value can indicate that a current period tax position reduced a firm's current period cash tax outflows, a large negative value could also represent firms increasing their current period UTB accrual for previously underreserved positions. Because the schedule does not reveal which scenario is occurring and a firm's UTB roll-forward schedule does not distinguish between UTB changes that do and do not affect the rate reconciliation, it is unclear whether this line item affects cash taxes paid in the current period.

[14] We expect changes in DTAs and DTLs related to M&A, depreciation, and NOLs to be most closely related to tax planning. However, we acknowledge that some of the changes in DTAs and DTLs in panel C of Table 4 could also be related to earnings management. For example, valuation allowances (e.g., Schrand and Wong 2003) and estimated reserves can be used to manage pretax financial reporting earnings without impacting the amount of tax a firm pays.

[15] We do not identify a proxy for "reserves" as there are many accounts where the financial reporting expense differs from the tax reporting deduction.

Table 4 Small-Sample Exploratory Analysis of Income Tax Footnotes

	(1) Low tax and high ability ($N = 60$)			(2) High tax and low ability ($N = 60$)		(3) t-stat. (diff. in means)	(4) z-stat. (rank-sum test)
	Mean	P50	Pred. sign	Mean	P50		
			Panel A: Sample selection variables				
CASHETR	8.86%	6.08%	<	36.98%	36.86%	37.38***	9.45***
MASCORE	0.2032	0.1699	>	−0.0990	−0.0909	−19.37***	−9.45***
			Panel B: Tax rate reconciliation				
State taxes	2.47%	2.68%	<	3.19%	3.64%	1.80**	1.67**
Foreign taxes	−2.55%	0.00%	<	−1.58%	0.00%	1.10	0.18
R&D and other credits	−1.48%	0.00%	<	−0.89%	0.00%	1.43*	1.31*
Mergers and acquisitions	0.17%	0.00%	<	0.62%	0.00%	1.88**	2.61***
Domestic production activities deduction	−0.07%	0.00%	<	−0.16%	0.00%	−1.45	−1.51
Exempt income	−0.08%	0.00%	<	−0.17%	0.00%	−1.30	−1.11
Expenses	0.98%	0.00%	<	0.62%	0.00%	−1.19	−1.28
Other	0.25%	0.11%	<	0.26%	0.10%	0.03	−1.89*
Unrecognized tax benefits	−0.05%	0.00%	?	−0.19%	0.00%	−1.94*	−2.03**
			Panel C: Changes in deferred tax assets and liabilities				
Type of DTL or DTA							
ΔDTL-Mergers and acquisitions	0.0181	0.0000	>	0.0018	0.0000	1.63*	2.08**
ΔDTL-Depreciation	0.0144	0.0041	>	0.0420	−0.0011	0.770	1.51*
ΔDTA-NOLs and carry-forwards	−0.0156	−0.0018	<	0.1227	0.0000	1.93**	1.13
ΔDTA-Compensation	0.0140	0.0000	<	0.0197	0.0006	0.81	1.04
ΔDTA-Bad debts	0.0014	0.0000	<	0.0029	0.0000	0.68	−0.56
ΔDTA-Reserves	0.0022	0.0000	<	0.0567	0.0000	1.98**	1.66**
ΔDTA-Deferred revenues	0.0049	0.0000	<	0.0022	0.0000	−1.31	0.36
ΔDTA-Inventory	0.0019	0.0000	<	0.0013	0.0000	−0.18	−0.19

Notes. This table presents the results of an exploratory analysis using hand-collected data from income tax rate reconciliation and deferred tax asset and liability schedules. Observations were selected from each of the three most heavily represented industries in our sample (business services, electronics, and retail). Twenty observations were selected from each industry with *CASHETR* at the 25th percentile and *MASCORE* at the 75th percentile for the "Low tax and high ability" group. Another 20 observations were selected from each industry with *CASHETR* at the 75th percentile and *MASCORE* at the 25th percentile for the "High tax and low ability" group. Panel A presents descriptive statistics for our sample selection criteria based on *CASHETR* and *MASCORE*. Panel B presents income tax rate reconciliation data. Panel C presents the change in firms' deferred tax assets and liabilities from $t-1$ to t, scaled by pretax book income. The prefix "ΔDTL" ("ΔDTA") refers to the change in a deferred tax liability (asset) from $t-1$ to t. All continuous variables are winsorized at the 5th and 95th percentiles (pooled).

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively; two-tailed (one-tailed) p-values are used for unsigned (directional) predictions.

domestic (foreign) income adjusted for special items.[16] Results from reestimating Equation (1) after replacing *CASHETR* with *STATE_CETR* (*FOREIGN_CETR*) are presented in column (1) (column (2)) of panel A, Table 5. The *MASCORE* coefficient is negative and significant in both columns ($p < 0.01$), consistent with higher-ability managers achieving greater tax avoidance through state and foreign tax planning activities.

Empirical proxies capturing different types of state tax planning activities are not well established in the literature. One exception is Dyreng et al. (2013) who create measures capturing a strategy whereby firms shift royalty income into Delaware subsidiaries. This strategy allows intangible asset-intensive firms to avoid state income taxes because Delaware assesses a 0% income tax rate on royalty income while other states that permit separate filing or lack an economic nexus doctrine allow deductions for royalty payments. We follow the Dyreng et al. (2013) methodology and create indicator variables set equal to one for intangible asset-intensive firms with large numbers of subsidiaries in Delaware and states allowing separate filing or states without an economic nexus doctrine. We modify Equation (1) by interacting *MASCORE* with each of these variables but fail to find evidence that higher-ability managers avoid more state taxes by shifting income into Delaware subsidiaries (untabulated). We conclude that higher-ability managers use other tax planning strategies to reduce state income taxes (e.g., strategic apportionment, location decisions, exploiting state credits, etc.).

We next consider several ways in which higher-ability managers can reduce income tax payments through different types of foreign tax planning strategies. Firms can exploit multijurisdictional tax planning opportunities to either shift income into lower

[16] The predicted signs for all covariates are the same as in our main tests with the exception of *FOREIGN*. In our analysis of state ETRs, we make no signed prediction on the *FOREIGN* indicator variable because it is not clear whether firms with foreign operations will engage in more or less state tax planning. In our analysis of foreign ETRs, the *FOREIGN* indicator variable is removed from the regression as the sample as composed entirely of firms with foreign operations.

Table 5 How Do Higher-Ability Managers Avoid Taxes?

Panel A: State and foreign tax avoidance

		(1) Y = *STATE_CETR*		(2) Y = *FOREIGN_CETR*	
	Pred. sign	Coeff.	*t*-stat.	Coeff.	*t*-stat.
MASCORE	−	**−0.0831*****	**−5.81**	**−0.1183*****	**−4.01**
RD	−	0.0043	1.34	−0.0104**	−2.18
AD	+	0.1446	1.12	−0.0960	−0.45
CAPX	−	0.0125	1.14	−0.0202	−0.78
LEV	−	0.0304***	3.70	0.0525**	2.30
FOREIGN	?	0.0155***	3.40		
SIZE	?	0.0053*	2.10	0.0046	0.65
INTANG	−	−0.0137	−1.03	0.0030	0.09
NOL_DECREASE	−	−0.0064*	−1.73	−0.0125***	−2.76
Fixed effects		Firm and year		Firm and year	
Standard errors clustered by		Firm and year		Firm and year	
Adjusted R^2		0.2107		0.3363	
N		38,312		16,498	

Panel B: Tax avoidance through foreign activities

		(1) Income mobility		(2) Tax haven usage		(3) Tax sheltering	
Dependent variable: *CASHETR*	Pred. sign	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
MASCORE	−	−0.0589***	−4.76	−0.1714***	−9.59	−0.2002***	−6.00
INCOME_MOBILE	−	−0.0111	−1.10				
MASCORE × *INCOME_MOBILE*	−	**−0.0371***	**−1.44**				
#HAVENS	−			0.0007	0.14		
MASCORE × *#HAVENS*	−			**−0.0520****	**−2.11**		
PRED_SHELTER	−					−0.0290**	−2.01
MASCORE × *PRED_SHELTER*	−					**0.0183**	**0.47**
RD	−	−0.0006	−0.20	0.0042	1.23	0.0049*	1.99
AD	+	−0.0331	−0.38	0.1513	1.11	0.0001*	1.63
CAPX	−	0.0717***	5.00	0.0599***	3.22	0.0508***	3.05
LEV	−	−0.0179*	−1.42	0.0231*	1.67	0.0105	0.72
FOREIGN	−	0.0022	0.47	0.0116**	1.97	0.0116**	2.07
SIZE	?	0.0243***	6.83	0.0263***	7.39	0.0322***	6.04
INTANG	−	−0.0018	−0.11	−0.0099	−0.44	−0.0032	−0.02
NOL_DECREASE	−	−0.0367***	−11.15	−0.0476***	−10.33	−0.0427***	−9.72
Fixed effects		Firm and year		Firm and year		Firm and year	
Standard errors clustered by		Firm and year		Firm and year		Firm and year	
Adjusted R^2		0.3212		0.2482		0.2484	
N		40,304		44,616		35,236	

tax jurisdictions or create "stateless income" that is not taxable in any jurisdiction (De Simone et al. 2014, Kleinbard 2012). Firms can also shift income through transfer pricing strategies, setting the price of goods and services between related parties (e.g., transactions between a parent and subsidiary) in tax-advantaged ways. If one party is located in a jurisdiction with a lower income tax rate, a selling price can be set to shift profits from the higher tax to lower tax jurisdiction. Prior research also finds that foreign income and locating subsidiaries in foreign tax havens are associated with tax sheltering (e.g., Wilson 2009, Lisowsky 2010).

We expand Equation (1) and conduct cross-sectional tests interacting *MASCORE* with one of three variables: *INCOME_MOBILE*, *#HAVENS*, and *PRED_SHELTER*. If higher-ability managers better exploit these tax planning strategies, the interaction of *MASCORE* and each of these variables will be negative. *INCOME_MOBILE* is an indicator variable identifying firms that possess the greatest ability to shift income to lower tax jurisdictions (De Simone et al. 2014). The measure incorporates high-tech industry membership and annual rankings of R&D, advertising, foreign sales, and gross profit margins. Next, we follow prior research to identify firms with material operations located in foreign tax havens (Dyreng and Lindsey 2009). We use data disclosed in Exhibit 21 to firms' Form 10-K filings to determine the location of firms' material operations. *#HAVENS* is the natural log of one plus the number of material operations located in a tax haven country in year *t*.[17] Finally,

[17] Data on Exhibit 21 and tax haven country listings are downloaded directly from Scott Dyreng's website: http://faculty.washington.edu/pdemerj/data.html.

Table 5 (Continued)

Panel C: Tax avoidance through the R&D credit

Dependent variable: *RD_CREDIT*	Pred. sign	R&D credit claims Coeff.	*z*-stat.
MASCORE	?	−1.6364***	−3.84
RD	+	0.3835***	4.16
MASCORE × *RD*	+	**0.2978****	**1.78**
AD	?	0.1499	0.07
CAPX	?	−0.0313	−0.07
LEV	?	−0.6586*	−1.92
FOREIGN	?	−0.0220	−0.20
SIZE	?	0.3067**	2.55
INTANG	?	−0.4424	−0.93
NOL_DECREASE	?	0.0252	0.46
Fixed effects		Firm and year	
Standard errors clustered by		Firm and year	
Pseudo R^2		0.1152	
N(RD_CREDIT = 1)		4,896	
N		12,565	

Panel D: Tax avoidance through investing activities and credit carry-forwards

		(1) M&A activity		(2) Depreciation		(3) Utilizing NOLs	
Dependent variable: *CASHETR*	Pred. sign	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
MASCORE	−	−0.1833***	−10.01	−0.1040***	−3.69	−0.1866***	−11.26
GOODWILL	−	−0.0982***	−3.63				
MASCORE × *GOODWILL*	−	**0.1139**	**1.12**				
DEPR	−			0.2111***	5.00		
MASCORE × *DEPR*	−			**−0.6444*****	**−2.67**		
NOL_DECREASE	−	−0.0441***	−9.81	−0.0446***	−10.01	−0.0473***	−9.73
MASCORE × *NOL_DECREASE*	−					**−0.0119**	**−0.39**
RD	−	0.0029	0.92	0.0027	0.85	0.004	1.21
AD	+	0.1636*	1.30	0.1740*	1.35	0.1538	1.13
CAPX	−	0.0670***	3.80	0.0660***	3.73	0.0614***	3.33
LEV	−	0.0175	1.32	0.0212	1.58	0.0236*	1.70
FOREIGN	−	0.0113**	1.98	0.0122**	2.12	0.0113*	1.92
SIZE	?	0.0267***	7.13	0.0261***	6.81	0.0260***	6.90
INTANG	−	0.0518*	1.93	−0.0139	−0.62	−0.0087	−0.39
Fixed effects		Firm and year		Firm and year		Firm and year	
Standard errors clustered by		Firm and year		Firm and year		Firm and year	
Adjusted R^2		0.2473		0.2475		0.2480	
N		44,420		44,358		44,616	

Notes. This table presents large-sample tests of how managers avoid taxes. In panel A, we examine state and foreign income tax avoidance using OLS regressions. In panel B, we examine three ways that firms can avoid income taxes by engaging in foreign activities using OLS regressions. In panel C, we examine firms' propensity to make R&D credit claims using a logit regression. In panel D, we examine the impact of firms' investing and credit carry-forward activities on tax avoidance using OLS regressions. All variables are defined in the appendix and all continuous variables are winsorized at the 1st and 99th percentiles (pooled). Standard errors are adjusted for heteroskedasticity and two-way clustered by firm and year.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively; two-tailed (one-tailed) *p*-values are used for unsigned (directional) predictions. Coefficients, *t*-statistics, and *z*-statistics of interest are in bold.

we operationalize tax sheltering (*PRED_SHELTER*) using the predicted value from the tax shelter model in Lisowsky (2010). See the appendix for additional details regarding how these variables are constructed.

Panel B of Table 5 displays the results of these tests. Column (1) shows that the interaction of *MASCORE* and *INCOME_MOBILE* is negative and significant, consistent with foreign income shifting serving as another mechanism that explains how higher-ability managers avoid taxes. We note the main effect on *INCOME_MOBILE* is insignificant, suggesting that lower-ability managers fail to successfully utilize foreign income shifting strategies (e.g., transfer pricing) to reduce their cash ETRs. Column (2) shows that the interaction of *MASCORE* and *#HAVENS* is negative and significant, consistent with higher-ability managers shifting income to foreign tax havens as another type of foreign tax planning strategy. We also note that the insignificant main effect on *#HAVENS* suggests that lower-ability managers do not use havens to achieve tax avoidance. Finally, column (3) shows that the interaction of *MASCORE* and *PRED_SHELTER* is insignificant, suggesting that tax sheltering is not a mechanism used by higher-ability managers to reduce their firms' cash ETR. However, the main effect on *PRED_SHELTER* is negative and significant, suggesting that lower-ability managers are more likely to engage in tax sheltering activities to reduce tax payments. These findings provide insights into how higher-ability managers avoid taxes. Specifically, higher-ability managers with a superior understanding of their firm's operating environment are better able to identify income shifting and foreign transfer pricing opportunities relative to their lower-ability peers.

5.2.2. R&D Credit Utilization. The "R&D and other credits" line in panel B of Table 4 motivates our consideration of R&D tax credit utilization. Following Hoopes (2015) and Laplante et al. (2015), we use *RD_CREDIT*, an indicator set equal to one when a firm mentions the R&D tax credit in its Form 10-K, as a proxy for R&D tax credit claims. We replace *CASHETR* with *RD_CREDIT* in Equation (1) and estimate a logistic regression predicting the likelihood that firms will claim the R&D tax credit. We include the same control variables from Equation (1) to capture variation in firm characteristics and the costs and benefits of tax planning. Our variable of interest is the interaction of *MASCORE* and *RD*.[18] We predict that as ability and R&D spending increase, firms are increasingly likely to claim the R&D tax credit. We expect that *RD* will be positively related to the likelihood of R&D credit claims, but have no ex ante predictions for the control variables and *MASCORE*. We restrict our sample to firms reporting R&D expense with machine-readable Form 10-K filings on the U.S. Securities and Exchange Commission's EDGAR system, which we can link to Compustat ($N = 12{,}565$).[19] Within this sample, there are 4,896 firm-year observations with disclosures related to the R&D credit.

For ease of interpretation, we mean-center the *RD* variable and present the results in panel C of Table 5. We note the main effect on *MASCORE* is negative and significant. Because *RD* is mean-centered, this result indicates that higher-ability managers are less likely to utilize the R&D credit when their firm's R&D expenditures are equal to the sample mean. We also find that the coefficient on *RD* is positive ($p < 0.01$), consistent with greater reported R&D increasing the likelihood that firms will make R&D credit claims. Turning to our relation of interest, we find that the *MASCORE* × *RD* coefficient is positive ($p < 0.05$), consistent with higher-ability managers making more R&D credit claims as reported R&D expenditures increase.

5.2.3. Investing Activities and Credit Carry-Forwards. Our final set of large-sample tests consider whether higher-ability managers avoid taxes through more tax-efficient acquisition activity, depreciation deductions, or NOL utilization. We conduct cross-sectional tests by interacting *MASCORE* with various proxies for these three constructs. These results are presented in panel D of Table 5. First, we consider whether higher-ability managers structure M&A transactions more tax efficiently. For example, managers can structure acquisitions to obtain carryover tax basis when a target has large NOLs (while considering that the tax benefit of target NOLs to the acquirer is limited by Internal Revenue Code Section 382) or carry-forward tax credits. Alternatively, managers can structure acquisitions to obtain step-up basis in the acquired assets (either through an asset acquisition or a stock acquisition with an Internal Revenue Code Section 338(h)(10) Election), increasing the benefits of cost recovery reductions. We test the relation between managerial ability and M&A by interacting the variable *GOODWILL* with *MASCORE* in Equation (1). *GOODWILL* captures the presence and magnitude of M&A activity and is defined as goodwill scaled by total assets. We find that the coefficient on *GOODWILL* is negatively related to *CASHETR* ($p < 0.01$). However, we fail to find large-sample evidence that higher-ability managers structure their M&A transactions more tax efficiently than their lower-ability peers as the *MASCORE* × *GOODWILL* interaction term is insignificant.[20]

The "ΔDTL-Depreciation" line item in panel C of Table 4 motivates our column (2) analysis. We test whether higher-ability managers are better at investing in tax-advantaged fixed assets and/or identifying accelerated depreciation benefits in the tax code.

[18] We acknowledge that *RD_CREDIT* contains measurement error, as firms could mention the R&D tax credit in the context of being ineligible to take the credit. However, this source of measurement error should bias against finding a positive coefficient on the interaction of *MASCORE* and *RD*.

[19] Due to the inclusion of firm fixed effects, we lose 7,054 observations that always (or never) discuss the R&D tax credit in their Form 10-K filings over our sample period. Our findings hold when these observations are included and firm fixed effects are removed.

[20] Only goodwill that arises from taxable acquisitions is tax deductible for U.S. federal tax purposes, and it is not possible to distinguish deductible versus nondeductible goodwill in Compustat. It is also possible that *GOODWILL* captures firm sophistication, financial resources, or other firm characteristics. Thus, *GOODWILL* is a noisy proxy for the tax efficiency of managers' acquisition decisions. Replacing *GOODWILL* with variables that capture either the number or dollar value of deals completed as reported by the SDC database yielded similarly insignificant results.

We interact the variable *DEPR* with *MASCORE* in Equation (1). *DEPR* is defined as depreciation expense scaled by gross property, plant, and equipment. We find a negative and significant coefficient on this interaction, consistent with higher-ability managers structuring their capital investment decisions more tax efficiently than their lower-ability peers.

Finally, we test whether higher-ability managers generate tax savings by better utilizing their firms' NOL carry-forwards by interacting *MASCORE* and the variable *NOL_DECREASE* in Equation (1). *NOL_DECREASE* is an indicator variable set equal to one if a firm's NOLs decreased in year *t*. The interaction term is insignificant, indicating that we fail to find large-sample evidence that higher-ability managers better utilize NOLs relative to their lower-ability peers.

5.3. Opportunities and Incentives for Tax Avoidance

We also consider how opportunities and incentives for tax planning affect the extent to which higher-ability managers engage in tax avoidance. We view both as necessary conditions for tax avoidance to occur. First, we expect higher-ability managers to be better able to exploit tax avoidance opportunities, suggesting that ability should matter more when the opportunity to avoid taxes is greater. To test this assertion, we use larger within-industry-year variances in *CASHETRs* as a measure of greater variation in tax avoidance opportunities. *CASHETR_INDSD* is defined as the decile rank of the standard deviation of *CASHETR* at the industry-year level. The *CASHETR_INDSD* main effect reflects the relation between greater variation in tax avoidance opportunities and tax avoidance for managers of average ability (i.e., $MASCORE = 0$). As it is not clear how the average manager will respond to greater variation in tax avoidance opportunities, we make no prediction for the *CASHETR_INDSD* main effect. To test for cross-sectional variation in the relation between managerial ability and tax avoidance, we interact *MASCORE* with *CASHETR_INDSD* and reestimate Equation (1). We expect the interaction coefficient to be negative. As shown in column (1) of Table 6, the coefficient on the interaction of *CASHETR_INDSD* and *MASCORE* is negative ($p < 0.01$), consistent with higher-ability managers better exploiting tax planning opportunities.[21] This highlights that managerial ability and opportunities for tax avoidance are complementary in nature.

Second, we explore the role of equity incentives. Rego and Wilson (2012) show that *CEO_DELTA* and *CEO_VEGA*, which capture equity wealth and risk incentives, are both positively associated with tax avoidance. We add these two variables into our regression model.[22] In addition, we interact both *CEO_DELTA* and *CEO_VEGA* with *MASCORE* to determine if higher-ability managers respond differently to equity incentive compensation. We make no directional prediction regarding the interaction coefficients because it is not ex ante clear whether higher-ability executives will respond more or less to equity incentives relative to their lower-ability peers. These variables are not included in our main analyses because they are only available for Execucomp firms with necessary data, reducing the sample substantially to 13,427 firm-year observations.

In column (2) of Table 6, we find that the main effect of both *CEO_DELTA* and *CEO_VEGA* is negative ($p < 0.10$ or better), consistent with Rego and Wilson (2012). The coefficient on *MASCORE* also remains negative ($p < 0.01$), reducing the concern that *CEO_DELTA* and *CEO_VEGA* are correlated omitted variables. Turning to the interaction coefficients, we find that the interaction of *CEO_DELTA* and *MASCORE* is insignificant ($p > 0.10$), but the interaction between *CEO_VEGA* and *MASCORE* is positive ($p < 0.01$). The latter finding is consistent with equity incentive compensation that encourages greater risk taking having a stronger effect on lower-ability managers' tax avoidance activities. In sum, the findings in column (2) suggest that managerial ability and risk-based equity incentive compensation act as substitutes.

6. Robustness Tests

We perform several robustness tests to help rule out potential alternative explanations for our findings. The results of these tests are shown in Table 7 where we report the coefficient and *t*-statistics on *MASCORE* and other variables of interest but suppress the coefficients and *t*-statistics on all control variables for brevity.

6.1. Correlated Omitted Variables

6.1.1. Pretax Return on Assets. A potential alternative explanation for our findings is that firms managed by higher-ability executives have greater incentives and resources available for tax planning. Specifically, it is possible that *MASCORE* is capturing

[21] Interacting *MASCORE* with unranked values of the variable *CASHETR_INDSD* produces a large variance inflation factor (VIF) for our coefficient of interest. Using a decile-rank transformation for *CASHETR_INDSD* measure produces a VIF of 3.3, suggesting that this procedure successfully reduces the concern that our results are influenced by severe multicollinearity (Belsley et al. 1980).

[22] We obtain CEO option delta and vega values from Lalitha Naveen's website (http://sites.temple.edu/lnaveen/data/). Values of *CEO_DELTA* and *CEO_VEGA* are computed using the methodology from Core and Guay (2002), as used in Coles et al. (2006) and described in Coles et al. (2013).

Table 6 How Opportunities and Incentives Affect Tax Avoidance

		(1) Opportunities for tax planning		(2) CEO equity wealth and risk incentives	
Dependent variable: *CASHETR*	Pred. sign	Coeff.	*t*-stat.	Coeff.	*t*-stat.
MASCORE	−	−0.1042***	−5.62	−0.2301***	−6.26
CASHETR_INDSD	?	0.0097***	16.92		
MASCORE × *CASHETR_INDSD*	−	**−0.0153*****	**−5.25**		
CEO_DELTA	−			−0.0005*	−1.35
MASCORE × *CEO_DELTA*	?			**−0.0012**	**−0.82**
CEO_VEGA	−			−0.0027**	−2.30
MASCORE × *CEO_VEGA*	?			**0.0263*****	**2.98**
RD	−	0.0029	1.21	0.0042	1.04
AD	+	0.0002	0.92	0.1539	0.84
CAPX	−	0.0064***	3.35	0.0116	0.32
LEV	−	0.0098	1.42	−0.0064	−0.24
FOREIGN	−	0.0097*	1.83	0.0061	0.81
SIZE	?	0.0270***	6.89	0.0136*	1.66
INTANG	−	−0.0096	−0.39	0.0429	1.23
NOL_DECREASE	−	−0.0474***	−10.18	−0.0316***	−4.80
Fixed effects		Firm and year		Firm and year	
Standard errors clustered by		Firm and year		Firm and year	
Adjusted R^2		0.2552		0.2192	
N		44,616		13,427	

Notes. This table reports the results of OLS regressions examining opportunities and incentives for tax avoidance. All variables are defined in the appendix and all continuous variables are winsorized at the 1st and 99th percentiles (pooled). Standard errors are adjusted for heteroskedasticity and two-way clustered by firm and year.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively; two-tailed (one-tailed) p-values are used for unsigned (directional) predictions. Coefficients and t-statistics of interest are in bold.

the relation between pretax profitability and tax avoidance. Both Manzon and Plesko (2002) and Rego (2003) find that a firm's GAAP ETR is negatively related to pretax ROA, which they interpret to suggest that profitable firms have lower costs of tax avoidance and greater incentives and resources to engage in tax planning. Thus, we reestimate Equation (1) after controlling for pretax return on assets (*PTROA*). Column (1) of panel A of Table 7 reveals a large negative coefficient on *PTROA* ($p < 0.01$).[23] This finding is expected, as pretax book income is included in the *CASHETR* denominator and *PTROA* numerator, which induces a strong negative relation. The coefficient on *MASCORE* remains negative ($p < 0.01$) but is attenuated, possibly because *PTROA* captures an aspect of managerial ability that we are trying to capture with *MASCORE*.[24]

6.1.2. Growth Opportunities. It is possible that growth opportunities represent a correlated omitted variable if high-growth firms are able to avoid more taxes and higher-ability managers are attracted to firms with greater growth opportunities. We address this concern by including a firm's market-to-book (*MB*) ratio in Equation (1). Column (2) of panel A of Table 7 shows that the *MB* coefficient is negative ($p < 0.01$), consistent with higher-growth firms avoiding more tax. However, the *MASCORE* coefficient remains negative ($p < 0.01$).

6.1.3. Cash Flows and Cash Holdings. We also consider how cash flows and cash holdings could affect the relation between *MASCORE* and tax avoidance. While firms with greater cash holdings and free cash flows are expected to have greater resources for tax planning, their incentives for tax planning could be lower because they are not cash constrained. Equation (1) is reestimated after controlling for pretax free cash flows (*PTFCF*) and cash holdings (*CASH*). We compute a pretax free cash flow variable to avoid a mechanical relation with our dependent variable (which has cash taxes paid in the numerator) and

[23] While the *PTROA* coefficient is larger in magnitude than the *MASCORE* coefficient, the coefficients are not directly comparable as *MASCORE* is a residual from Equation (2b), and *PTROA* is the ratio of pretax income to assets.

[24] We do not control for *PTROA* in our primary tests for several reasons. First, accounting-based measures similar to pretax return on assets have been used as proxies for managerial ability (e.g., Baik et al. 2011). Second, Manzon and Plesko (2002) state that "profitable firms can make *efficient* use of tax deductions and tax credits and benefit from tax exemptions" (p. 194; emphasis added), but we believe that managers are making efficient use of tax deductions, credits, and benefits. Both papers highlight that including *PTROA* as a control variable in Equation (1) could figuratively "throw the baby out with the bathwater" in our setting.

Table 7 Robustness Tests

Panel A: Additional control variables

Dependent variable: *CASHETR*	Pred. sign	(1) Controlling for profitability Coeff.	(1) *t*-stat.	(2) Controlling for growth opportunities Coeff.	(2) *t*-stat.	(3) Controlling for cash flows and holdings Coeff.	(3) *t*-stat.	(4) Controlling for governance Coeff.	(4) *t*-stat.	(5) Controlling for option exercises Coeff.	(5) *t*-stat.
MASCORE	−	**−0.0708*****	**−4.28**	**−0.1780*****	**−11.55**	**−0.1660*****	**−10.04**	**−0.1868*****	**−11.77**	**−0.1591*****	**−5.16**
PTROA	−	−0.3224***	−17.94								
MB	−			−0.0038***	−7.48						
PTFCF	±					−0.7305***	−35.84				
CASH	±					0.0805***	5.43				
INST_OWN	+							0.0343***	2.93		
EST_OPTION	−									−0.2321***	−5.29
Firm-level controls, firm fixed effects, and year fixed effects		Included		Included		Included		Included		Included	
Adjusted R^2		0.2641		0.2483		0.2929		0.2482		0.2404	
N		44,599		43,023		44,609		44,616		10,366	

Panel B: Alternative definitions of *CASHETR*

	Pred. sign	(1) Y = *CASHETR_ADJ* Coeff.	(1) *t*-stat.	(2) Y = *CASHTAX_NC* Coeff.	(2) *t*-stat.
MASCORE	−	**−0.1821*****	**−11.96**	**−0.0065*****	**−8.96**
Firm-level controls, firm fixed effects, and year fixed effects		Included		Included	
Adjusted R^2		0.2286		0.2287	
N		44,616		42,189	

Panel C: Decomposing *MASCORE* using a fixed effects research design

Dependent variable: *CASHETR*	Pred. sign	(1) Executive-year-level analysis Coeff.	(1) *t*-stat.	(2) Firm-year-level analysis Coeff.	(2) *t*-stat.
MASCORE_MGRFE	−	**−0.2262*****	**−3.48**	**−0.2117*****	**−3.40**
MASCORE_OTHER	−	−0.1933***	−3.32	−0.1985***	−3.69
Firm-level controls, firm fixed effects, and year fixed effects		Included		Included	
Standard errors clustered by		Executive and year		Firm and year	
Adjusted R^2		0.2913		0.2448	
N		7,913		5,705	

Notes. This table presents the results of robustness tests. All variables are defined in the appendix and all continuous variables are winsorized at the 1st and 99th percentiles (pooled). Standard errors are adjusted for heteroskedasticity and two-way clustered by firm and year in all columns with the exception of column (1) of panel C where standard errors are clustered at the executive and year level.

***Indicates significance at the 1% level; two-tailed (one-tailed) *p*-values are used for unsigned (directional) predictions. Coefficients and *t*-statistics of interest are in bold.

our free cash flow variable. Column (3) of panel A of Table 7 shows that the *PTFCF* (*CASH*) coefficient is negative (positive) ($p < 0.01$), suggesting that firms with greater cash flows (cash on hand) have different incentives for tax avoidance. Most importantly, the coefficient on *MASCORE* remains negative ($p < 0.01$).

It is possible that strategic operating decisions affect both tax avoidance and firm efficiency, such that firms are reaching the efficient frontier in part due to favorable tax outcomes that result from efficient decision making. We note that Equation (2b) only includes an indicator variable for positive free cash flow. As free cash flow is affected by cash taxes paid, the use of an indicator assigns virtually all variation in cash flows to managers through the Equation (2b) residual. As after-tax free cash flows are a function of cash taxes paid, as well as firms' operating, investing, and financing activities, the use of an indicator variable could create a mechanical relation between cash taxes paid and *MASCORE*. To address this concern, we reestimate *MASCORE* after including after-tax free cash flows as an additional independent variable in Equation (2b).[25] We reestimate Equation (1) using this modified *MASCORE* variable and continue to find a negative association between ability and *CASHETR* ($p < 0.01$; untabulated). These findings help to reduce concerns of a mechanical relation between tax avoidance and *MASCORE* due to strategic operating decisions affecting both tax avoidance and firm efficiency.[26]

6.1.4. Corporate Governance. Another possible alternative explanation is that *MASCORE* is simply capturing better corporate governance. If better governance structures allow firms to identify, hire, and retain higher-ability managers, corporate governance is potentially a correlated omitted variable.[27] We include governance as an independent variable using the percentage of shares held by institutional owners (*INST_OWN*) following Desai and Dharmapala (2006, 2009). Column (4) of panel A of Table 7 shows that *INST_OWN* is positively related to *CASHETR* ($p < 0.01$) and the *MASCORE* coefficient remains negative ($p < 0.01$). We obtain similar inferences when *INST_OWN* is replaced with the G-Index from Gompers et al. (2003) or the E-Index from from Bebchuk et al. (2009) (untabulated).

6.1.5. Stock Option Exercises. We also consider the possibility that stock option exercises are a correlated omitted variable. Hanlon and Shevlin (2002) note that stock options can generate large tax return deductions, which lowers cash taxes paid (the *CASHETR* numerator). Because stock option compensation was not recognized as an income statement expense for most of our sample period (i.e., before 2006), pretax book income (the *CASHETR* denominator) does not reflect this expense. This asymmetric treatment of stock option compensation mechanically lowers *CASHETR* before 2006. To rule out the possibility that the *MASCORE* coefficient is simply capturing the relation between stock options and cash ETRs, following Dyreng et al. (2010) we include the estimated value of stock option exercises (*EST_OPTION*) as an additional control variable in Equation (1). As *EST_OPTION* requires Execucomp information and is available only through 2006, our sample is reduced by 77% to 10,366 observations. Column (5) of panel A of Table 7 shows that the *EST_OPTION* coefficient is negative ($p < 0.01$), and the *MASCORE* coefficient remains negative ($p < 0.01$).

6.2. Alternative Definitions of *CASHETR*

It is possible that executives with greater ability to manage resources efficiently belong to industries with lower effective tax rates and that larger firms have greater opportunities available for tax planning. Balakrishnan et al. (2012) highlight the importance of industry membership and firm size in assessing tax avoidance. To address this concern, we replace *CASHETR* in Equation (1) with a size- and industry-adjusted cash ETR following Balakrishnan et al. (2012) (*CASHETR_ADJ*). Column (1) of panel B of Table 7 shows that we continue to find a negative coefficient on *MASCORE* ($p < 0.01$) using this alternative dependent variable.

It is also possible the positive correlation between *MASCORE* and pretax book income (the *CASHETR* denominator) induces a negative relation between *MASCORE* and *CASHETR*. To address this concern, we replace *CASHETR* with the "cash tax nonconformity measure" developed in Henry and Sansing (2016). Their measure, which we label as *CASHTAX_NC*, removes pretax book income from the denominator to eliminate the potential for a mechanical relation between *MASCORE* and tax avoidance. *CASHTAX_NC* is defined as the difference between cash taxes paid and the U.S. federal statutory tax rate of 35% multiplied by pretax income adjusted for special items, deflated by the market value of assets. Lower values indicate greater tax avoidance. Column (2) of panel B of Table 7 shows that managerial ability is associated with greater tax avoidance ($p < 0.01$) using this alternative dependent variable.[28]

6.3. Decomposing *MASCORE* Using a Fixed Effects Research Design

A potential concern is that *MASCORE* may capture firm characteristics instead of a manager-specific effect. Demerjian et al. (2012) demonstrate that *MASCORE* is associated with manager fixed effects, reducing this concern. To ensure that we are capturing

[25] We follow Demerjian et al. (2012) and compute free cash flows as operating income before depreciation (*oibdp*), minus net working capital accruals ($rect + invt + aco - lco - ap$), minus capital expenditures (*capx*), all deflated by total assets (*at*). We then subtract taxes paid (*txpd*) scaled by total assets to generate a measure of after-tax free cash flows.

[26] In an untabulated test, we reestimate Equation (1) using only the subsample of firm-year observations with negative free cash flows ($N = 12{,}947$). If tax avoidance simply increases firm efficiency through its impact on positive free cash flows, we should fail to find a relation between *MASCORE* and *CASHETR* in firms with negative free cash flows. We continue to find a negative coefficient on *MASCORE* within this subsample ($p < 0.01$).

[27] However, some prior research finds that managers in better governed firms engage in less tax avoidance (e.g., Desai and Dharmapala 2006). If *MASCORE* simply captures better governance, we would expect higher-ability managers to engage in less tax avoidance, which is inconsistent with our findings.

[28] Henry and Sansing (2016) show that inferences from studies using effective tax rates can be sensitive to eliminating observations where pretax income or cash taxes paid are less than zero. When we remove these two data restrictions in our sample composition, the number of observations increases to 65,158 firm-year observations, and we continue to find a negative relation between *MASCORE* and *CASHTAX_NC* ($p < 0.01$; untabulated).

managers' impact on firm efficiency, we decompose *MASCORE* into two components. The first component isolates the stationary effect of each individual manager on *MASCORE* over time, and the second component captures all other determinants of *MASCORE* unrelated to the stationary effect of individual managers (e.g., stationary firm and year effects, time-varying firm and manager characteristics, etc.). We use a manager fixed effects research design to decompose *MASCORE* into these two components by estimating the following equation:

$$\begin{aligned} MASCORE_{it} = {} & \beta_k \times ManagerFixedEffects \\ & + \alpha_i \times FirmFixedEffects \\ & + \gamma_t \times YearFixedEffects + \varepsilon_{it}. \end{aligned} \tag{3}$$

Following Dyreng et al. (2010), we use Execucomp to identify the top five most highly compensated managers for each firm-year and estimate Equation (3) on the subsample of managers that move across firms over time and hold a management position for at least three years in at least two separate firms.[29] We obtain a manager fixed effect coefficient (β_k) for 1,184 individual managers, yielding the stationary manager-specific component of *MASCORE* that we label *MASCORE_MGRFE*.[30] We compute the portion of *MASCORE* not explained by manager fixed effects, which we refer to as *MASCORE_OTHER*, as the difference between *MASCORE* and *MASCORE_MGRFE*.

Column (1) of panel C of Table 7 reports the results of reestimating Equation (1) at the manager-year level after decomposing *MASCORE* into the two subcomponents. The *MASCORE_MGRFE* coefficient is negative ($p < 0.01$), providing further evidence of a manager-specific effect on tax avoidance. The *MASCORE_OTHER* coefficient is also negative ($p < 0.01$). Because the model controls for firm fixed effects, year fixed effects, and time-varying firm characteristics related to tax avoidance, the *MASCORE_OTHER* coefficient reflects the impact of time-varying manager characteristics, the joint effects of the management team working together, and other potential effects of time-varying firm characteristics not specified in the construction of *MASCORE*. There are 3,805 executive-year observations where more than one manager within this sample holds a position at the same firm. As shown in column (2), results are qualitatively similar if we estimate Equation (1) at the firm-year level after summing the individual manager fixed effect coefficients (i.e., β_k) within each firm-year observation to obtain a single *MASCORE_MGRFE* at the firm-year level ($p < 0.01$).

6.4. Difference-in-Differences Tests Surrounding CEO Turnovers

In our final robustness test, we employ a difference-in-differences research design that exploits CEO turnovers. This research design provides stronger identification of the relation between managerial ability and tax avoidance and helps to further rule out the possibility of correlated omitted variables driving our main findings.[31] If *MASCORE* captures a manager effect, we should observe a change in tax avoidance after a new CEO with differing ability joins a firm. This change could occur for several reasons (e.g., a new CEO hires former employees and/or consultants to identify and implement tax avoidance strategies at the new firm). However, if *MASCORE* is affected by factors unrelated to changes in management not adequately controlled for when constructing *MASCORE*, we should observe no significant difference in tax avoidance following CEO turnovers.

We estimate the following regression to examine changes in tax avoidance that relate to changes in managerial ability following CEO turnovers:

$$\begin{aligned} \Delta CASHETR3_{it} = {} & \alpha_0 + \beta_1 \Delta MASCORE3_{it} \\ & + \beta_2 TURNOVER_{it} + \beta_3 \Delta MASCORE3_{it} \\ & \times TURNOVER_{it} + \Delta Controls_{it} \\ & + YearFixedEffects + \varepsilon_{it}. \end{aligned} \tag{4a}$$

[29] Consistent with studies using a manager fixed effects design, we include all managers rather than a limited subsample of CEOs. This choice is particularly important in our setting for several reasons. First, all executives have the potential to affect corporate tax planning (Dyreng et al. 2010). Second, it is common for a manager to move from a non-CEO to CEO position across firms (Dyreng et al. 2010), and restricting this analysis only to CEOs would eliminate these observations, reducing our sample by nearly 50%. We acknowledge the importance of the CEO at setting a firm's "tone at the top" and firm policies in our CEO turnover analyses. This robustness test supplements the findings reported in our CEO turnover analyses by capturing the effects of non-CEO executives.

[30] As previously mentioned, Fee et al. (2013) demonstrate that standard tests of joint significance of manager fixed effect coefficients used in prior studies could be econometrically invalid. As we are focused on the individual manager fixed effect coefficients and not their joint significance, this criticism is less of a concern in our setting.

[31] We focus on CEOs and not CFOs or tax directors in this analysis for two reasons. First, CEOs generally have the most influence setting the "tone at the top," the effects of which cascade to other managers within the organization (e.g., Feng et al. 2011). Second, we rely on Execucomp data to identify managerial turnover events. Execucomp collects data relating to the five most highly compensated employees, which includes the CEO in almost every firm. In contrast, other types of executives (e.g., CFOs and tax directors) are not uniformly among the five most highly compensated employees across Execucomp firms over time, resulting in the potential misclassification of a treatment firm (e.g., a firm with a CFO or tax director departure) as a control firm (e.g., a firm without a CFO or tax director departure).

The dependent variable, $\Delta CASHETR3$, is the difference between firm i's three-year cash ETR in $t+1$ through $t+3$ and $t-3$ through $t-1$. $\Delta MASCORE3$ is the difference between firm i's managerial ability score summed over $t+1$ through $t+3$ (which reflects the new CEO's ability) and $t-3$ through $t-1$ (which reflects the prior CEO's ability). The indicator variable *TURNOVER* is set equal to one if a CEO departs firm i in year t and zero otherwise. Control variables are the same as presented in Equation (1) but measured as the difference between their values summed from $t+1$ through $t+3$ and $t-3$ through $t-1$. The inclusion of these controls further isolates the manager-specific effect attributable to the CEO turnover. We omit the turnover year from our analysis to control for CEO departures on various dates throughout year t.

Our identification strategy in this test relies on the assumption that changes in *MASCORE* for turnover firms are more likely to arise from a change in the management team, as opposed to changes in a firm's operating environment and economic conditions not adequately controlled for when constructing *MASCORE*. The coefficient on the interaction of $\Delta MASCORE3$ and *TURNOVER*, β_3, captures the manager-specific effect on tax avoidance following the turnover event. Finding that β_3 is negative and significant is consistent with a higher-ability CEO engaging in greater tax avoidance relative to a lower-ability predecessor. Although β_1 is not part of the identification strategy in the difference-in-differences test because the coefficient does not reflect the treatment effect, changes in managerial ability in nonturnover control firms should be negatively associated with changes in tax avoidance. Therefore, the predicted sign on β_1 is negative.

Control firms are identified using propensity score matching (PSM), which also helps to rule out the effects of potentially correlated omitted variables related to CEO turnover and tax avoidance. Following prior literature (e.g., Desai et al. 2006, Skaife et al. 2013), we estimate the likelihood of CEO turnover with the following logistic regression:

$$\begin{aligned} TURNOVER_{it} = {} & \alpha_0+\beta_1 SIZE_{it}+\beta_2 INDROA_{it} \\ & +\beta_3 GROWTH_{it}+\beta_4 LEV_{it} \\ & +\beta_5 BTM_{it}+\beta_6 ANALYST_{it} \\ & +\beta_7 INST\_OWN_{it}+\beta_8 CEO\_TENURE_{it} \\ & +\beta_9 CEO\_CHAIR_{it}+\beta_{10} CEO\_AGE_{it} \\ & +\beta_{11} BHAR_{it}+\beta_{11} MASCORE_{it} \\ & +YearFixedEffects+\varepsilon_{it}. \end{aligned} \tag{4b}$$

We model the probability of a CEO turnover in year t as a function of firm size (*SIZE*), leverage (*LEV*), growth (*GROWTH* and *BTM*), performance (*INDROA*), the monitoring environment (*ANALYST* and *INST_OWN*), executive characteristics (*CEO_TENURE*, *CEO_CHAIR*, and *CEO_AGE*), and prior year stock returns (*BHAR*). See the appendix for detailed variable definitions. We also control for *MASCORE* to ensure that the managerial team's ability to manage resources efficiently in year t is not a correlated omitted variable. Using PSM imposes no assumptions about the functional form of the relation between the selection variables with the outcome variable. This approach also mitigates the critique of Fee et al. (2013) that management style is observable only after endogenous turnover decisions, as PSM controls for factors found to be associated with forced CEO dismissals.

To estimate the probability of CEO turnover (Equation (4b)), we begin with the 16,043 firm-year observations in our primary sample with CEO data on Execucomp. This restriction reduces our sample size by 64%. Next, we remove observations with more than one CEO turnover event between $t-3$ and $t+3$ ($N = 139$). Requiring nonmissing data to estimate Equations (4a) and (4b) over this seven-year period reduces the sample to 3,527 observations. Approximately 11.5% of the 3,527 observations ($N = 404$) have a turnover event. Column (1) in panel A of Table 8 presents the results from estimating Equation (4b). The area under the receive operating characteristic (ROC) curve of 0.856 indicates that the model exhibits strong explanatory power.

We use the propensity scores generated from Equation (4b) to create a matched sample of 404 treatment and 404 control observations. Column (2) of panel A of Table 8 shows that covariate mean values are statistically indistinguishable between treatment and control firms for all but 3 of the 12 variables in Equation (4b): *CEO_TENURE*, *CEO_CHAIR*, and *CEO_AGE*. Before log transformations, mean CEO tenure is only 4.3 months longer and CEOs are only 1.6 years older at turnover firms (untabulated). In addition, slightly less than half of the CEOs at turnover firms (45.5%) hold the chairman position, compared to slightly more than half at nonturnover firms (57.4%). We conclude that, while the differences between the treatment and control samples are statistically significant, they do not appear to be economically significant.

Column (1) in panel B of Table 8 presents the results from estimating the Equation (4a) difference-in-differences regression using the PSM sample of 404 treatment and 404 control observations. The negative coefficient on the interaction of $\Delta MASCORE3$ and *TURNOVER* ($p < 0.10$) indicates that a new CEO with higher ability is able to avoid more taxes than a lower-ability predecessor. Moving from the lower

Table 8 CEO Turnover Analyses

Panel A: Modeling CEO turnover to calculate propensity scores

		(1) $Y = TURNOVER$		(2) Propensity matched sample means		
	Pred. sign	Coeff.	z-stat.	Treatment ($N = 404$)	Control ($N = 404$)	t-stat. (diff. in means)
SIZE	?	0.0103	0.55	7.6567	7.5830	0.71
INDROA	−	0.0992	0.31	0.0670	0.0604	0.87
GROWTH	−	−0.4115**	−1.92	0.0837	0.1051	−1.48
LEV	?	−0.3117	−1.04	0.1906	0.1940	−0.31
BTM	+	−0.0787***	−4.74	0.3469	0.4789	−1.39
ANALYST	+	0.0212	0.58	1.9782	1.8907	1.20
INST_OWN	+	−0.1568	−0.43	0.1552	0.1597	−0.42
CEO_TENURE	−	−1.0206***	−17.80	0.8098	1.3233	−7.62***
CEO_CHAIR	−	−0.0381	−0.36	0.4555	0.5743	−3.40***
CEO_AGE	+	2.4545***	6.75	4.0098	4.0412	−3.32***
BHAR	−	−0.1082	−1.22	0.0869	0.0864	0.02
MASCORE	−	−0.2420	−1.12	0.0174	0.0225	−0.56
Fixed effects		Year				
Pseudo R^2		0.3437				
Area under ROC curve		0.8561				
N		3,527				
N (*TURNOVER* = 1)		404				

Panel B: Difference-in-differences regressions

		(1) PSM sample		(2) Non-PSM sample	
Dependent variable: $\Delta CASHETR3$	Pred. sign	Coeff.	t-stat.	Coeff.	t-stat.
$\Delta MASCORE3$	−	0.0950	1.43	−0.0023	−0.11
TURNOVER	?	0.0006	0.02	−0.0167	−1.05
$\Delta MASCORE3 \times TURNOVER$	−	**−0.1512***	**−1.53**	**−0.0928*****	**−2.38**
$\Delta RD3$	−	−0.0113	−1.24	−0.0124***	−2.80
$\Delta AD3$	+	−0.1624	−0.38	0.0441	0.21
$\Delta CAPX3$	−	0.0933*	1.75	0.0134	0.61
$\Delta LEV3$	−	−0.0584*	−1.64	−0.0075	−0.48
$\Delta FOREIGN3$	−	0.0222*	1.65	0.0003	0.05
$\Delta SIZE3$	?	0.0259*	1.70	0.0192***	3.81
$\Delta INTANG3$	−	−0.0840***	−2.81	0.0142	0.67
$\Delta NOL\_DECREASE3$	−	0.0063	0.41	−0.0097*	−1.67
Fixed effects		Industry and year		Industry and year	
Standard errors clustered by		Firm and year		Firm and year	
Adjusted R^2		0.0157		0.0495	
N		808		3,928	

Notes. This table presents the results of CEO turnover analyses using a difference-in-differences design. Panel A presents the results from estimating a probit regression specification to calculate propensity score values and a comparison of means for treatment and propensity-score-matched control observations. Panel B presents the results from a difference-in-differences analysis estimating OLS regressions. Column (1) uses the sample of 404 propensity-score matched firm pairs and column (2) uses all firm-year observations with available data. All variables are defined in the appendix and all continuous variables are winsorized at the 1st and 99th percentiles (pooled). Standard errors are adjusted for heteroskedasticity and two-way clustered by firm and year. Industry membership is based on the Fama–French 48 classifications.

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively; two-tailed (one-tailed) p-values are used for unsigned (directional) predictions. Coefficients and t-statistics of interest are in bold.

to upper quartile of the change in *MASCORE* following a CEO turnover results in a 4.37% decline in a firm's *CASHETR* during the three years following the turnover relative to the three-year period before the predecessor CEO departure (untabulated).[32] Because PSM tests can be sensitive to the variables included in the first-stage regression (Tucker 2010), we also estimate Equation (4a) using the full sample of Execucomp firms with available data ($N = 3{,}928$). These results are presented in column (2) and yield similar inferences.

[32] Because we found significant differences in *CEO_TENURE*, *CEO_CHAIR*, and *CEO_AGE* values between treatment and control groups in panel A, we repeat our test controlling for all variables from Equation (4b). Our results are robust to adding these additional controls (untabulated).

We note that the $\Delta MASCORE3$ coefficient is insignificant in both columns. This insignificant result could be attributable to several features of this alternative research design. Equation (4a) is estimated within a substantially reduced sample of Execucomp firms with seven consecutive years of nonmissing data. Prior research shows that Execucomp firms differ from the Compustat population along a variety of dimensions (e.g., Cadman et al. 2010), and imposing further restrictions on this sample reduces the power of our tests. Despite these limitations, the findings in Table 8 corroborate our main inference that higher-ability managers are able to avoid more taxes.

7. Conclusion

We examine whether executives with greater ability to manage resources efficiently engage in greater corporate tax avoidance. Higher-ability managers have a superior understanding of their firms' operating environment, enabling them to better align business decisions with tax strategies and identify tax planning opportunities. We find evidence consistent with higher-ability executives engaging in more tax avoidance activities that reduce their firms' cash tax payments. Moving from the lower to upper quartile of managerial ability is associated with a 3.15% (2.50%) reduction in a firm's one-year (five-year) cash ETR. Additional tests reveal that higher-ability executives reduce taxes by shifting income to foreign tax havens, engaging in state tax planning, making more R&D credit claims, and investing in assets that generate accelerated depreciation deductions. These findings shed light on important ways in which executives make decisions that align business and tax strategies. Cross-sectional analyses reveal that higher-ability managers avoid more tax when there is greater variation in tax avoidance opportunities within their industry, suggesting ability and tax avoidance opportunities are complements. In contrast, lower-ability managers respond more to equity compensation that incentivizes tax avoidance, suggesting ability and compensation incentives are substitutes. We address whether managerial ability and income tax avoidance are endogenously related through a battery of robustness tests (e.g., additional control variables, decomposing the managerial ability measure into firm fixed effects and manager fixed effects, an alternative measure of managerial ability that controls for firm resources provided by tax avoidance, CEO turnover analyses, etc.).

Our study is subject to several limitations. Many strategic decisions of managers are unobservable. Therefore, our empirical tests rely on information extracted from financial statements to infer managers' strategic choices. Another limitation is that our tax avoidance measures only capture explicit and nonconforming tax avoidance. Therefore, we do not provide evidence on conforming tax avoidance strategies or the avoidance of implicit taxes. In addition, we acknowledge that some of the variables we use to capture how higher-ability managers avoid taxes are noisy proxies for the underlying economic constructs. For example, some changes in deferred tax assets and liabilities can arise from earnings management rather than tax planning activities, and our proxy for M&A activity does not necessarily capture the effects that tax-deductible goodwill or other tax benefits generated through specific transaction structuring decisions. Finally, it is possible that managerial ability captures some aspect of firms' operating, investing, and financing environments for which we have not adequately controlled. While our difference-in-differences research design and decomposition of the managerial ability measure into firm and manager fixed effects both reduce the likelihood that environmental characteristics are driving our inferences, we cannot completely rule out this alternate explanation.

We contribute to both the tax avoidance and managerial ability literatures by identifying executives' ability to manage resources efficiently as a new and economically significant determinant of corporate tax avoidance. Our research answers the call by Hanlon and Heitzman (2010) to further explore the effect of individual managers on corporate tax avoidance. Many of the documented determinants of tax avoidance (e.g., industry, capital structure, location of operations, etc.) are the result of years of strategic decision making, and changing these firm-level characteristics simply to achieve additional tax avoidance is difficult and costly. Identifying a specific manager characteristic associated with lower corporate tax payments advances our knowledge of the factors that influence corporate tax planning. We encourage future research to identify other manager characteristics associated with tax planning, as well as to provide more evidence on the specific mechanisms managers use to achieve tax avoidance. Quantifying the economic importance of manager characteristics and specific mechanisms for tax avoidance would make an important contribution to the literature.

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Appendix. Variable Definitions

	Dependent variables (tax avoidance proxies)
$CASHETR_{it}$	Cash taxes paid (*txpd*) divided by pretax book income before special items (*pi-spi*). We require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
$CASHETR3_{it}$	Sum of cash taxes paid (*txpd*) in periods t through $t+2$ divided by pretax book income before special items (*pi-spi*) in periods t through $t+2$. We require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
$CASHETR5_{it}$	Sum of cash taxes paid (*txpd*) in periods t through $t+4$ divided by pretax book income before special items (*pi-spi*) in periods t through $t+4$. We require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
$CASHETR\_ADJ_{it}$	Difference between the cash ETR for firm i and the mean cash ETR for the corresponding set of firms belonging to the same Fama–French 48 industry and asset-size quintile in year t (following Balakrishnan et al. 2012)
$CASHTAX\_NC_{it}$	Difference between cash taxes paid and 35% multiplied by pretax income adjusted for special items, deflated by the market value of assets ($at + prcc\_f \cdot csho - seq$) (following Henry and Sansing 2016)
$FOREIGN\_CETR_{it}$	Current foreign income tax expense (*txfo*) scaled by pretax foreign income (*pifo*). We require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
$STATE\_CETR_{it}$	Current state income tax expense (*txs*) scaled by pretax domestic income adjusted for special items (*pidom-spi*). We require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
$\Delta CASHETR3_{it}$	Three-year cash ETR in $t+1$ through $t+3$ less the three-year cash ETR in $t-3$ though $t-1$
	Independent variables
AD_{it}	Advertising expense (*xad*) deflated by sales (*sale*)
$ANALYST_{it}$	Natural log of one plus the number of analysts issuing annual earnings forecasts for firm i in year t (source: Institutional Brokers' Estimate System (IBES))
$BHAR_{it}$	Prior year market-adjusted buy-and-hold annual abnormal stock return (source: Center for Research in Security Prices)
BTM_{it}	Ratio of the book value of common equity (*ceq*) to market value of common equity ($csho \cdot prcc\_f$)
$CAPX_{it}$	Ratio of capital expenditures (*capx*) to gross property, plant, and equipment (*ppegt*)
$CASH_{it}$	Ratio of cash holdings (*che*) to total assets (*at*)
$CASHETR\_INDSD_{it}$	Decile rank of the standard deviation of *CASHETR* estimated by industry year; industries defined using the Fama–French 48 classification
CEO_AGE_{it}	CEO's age as of year t (source: Execucomp)
CEO_CHAIR_{it}	Indicator coded equal to one if a firm's CEO is also the board of directors' chairman and coded equal to zero otherwise (source: Execucomp)
CEO_DELTA_{it}	The dollar change in CEO wealth associated with a 1% change in the firm's stock price (in \$M) (source: Execucomp)
CEO_TENURE_{it}	Number of years a firm's current CEO has served as CEO at firm i as of t (source: Execucomp)
CEO_VEGA_{it}	The dollar change in CEO wealth associated with a 1% change in the standard deviation of the firm's stock returns (in \$M) (source: Execucomp)
$DEPR_{it}$	Depreciation expense ($dp - am$) scaled by gross property, plant, and equipment (*ppegt*)
EST_OPTION_{it}	Average annual value realized from exercise of options for the top executives grossed up by the fraction of options owned by the covered executives (source: Execucomp), scaled by average total assets (following Dyreng et al. 2010)
$FOREIGN_{it}$	Indicator coded equal to one if pretax foreign income from operations (*pifo*) is nonzero and coded equal to zero otherwise

Appendix (Continued)

$GOODWILL_{it}$	Goodwill (*gdwl*) scaled by total assets (*at*)
$GROWTH_{it}$	Percentage sales growth in current year sales calculated as sales in year t divided by sales in year $t-1$ (*sale*), minus one
$INCOME\_MOBILE_{it}$	Indicator variable set equal to one if the sum of the annual rank of R&D (*xrd/at*), advertising (*xad/at*), percentage of foreign sales reported in the Compustat Segments database to total sales (*sale*), and percentage gross profit (*gp/sale*) plus four for firms in high-tech industries, is in the top quintile, and set equal to zero otherwise (following De Simone et al. 2014)
$INDROA_{it}$	Ratio of income before extraordinary items (*ib*) to average total assets (*at*) minus the industry-year median at the two-digit SIC code level
$INST\_OWN_{it}$	Percentage of shares held by institutional shareholders (source: Thomson-Reuters Institutional Holdings (13F) Database)
$INTANG_{it}$	Ratio of intangible assets (*intan*) to total assets (*at*)
LEV_{it}	Ratio of total debt ($dltt + dlc$) to total assets (*at*)
$MASCORE_{it}$	Managerial ability score from Demerjian et al. (2012), computed using data envelopment analysis (DEA) where total sales is optimized using the vector of inputs including net PP&E, operating leases, R&D, purchased goodwill and intangibles, cost of goods sold, and SG&A. The DEA is optimized at the industry and year levels, and a firm efficiency score is computed. The firm efficiency score is then regressed on firm characteristics (size, market share, positive free cash flow, age, business segment concentration, a foreign currency indicator, and year indicators), and the residual from this regression is the managerial ability score. See Demerjian et al. (2012) for additional details.
$MASCORE\_MGRFE_{it}$	Manager fixed effect coefficient computed from estimating Equation (3) within the subsample of executives moving across firms over time where each executive is present at each firm for at least three years
$MASCORE\_OTHER_{it}$	Difference between *MASCORE* and *MASCORE_MGRFE*
MB_{it}	Ratio of the market value of common equity ($csho \cdot prcc\_f$) to book value of common equity (*ceq*)
$NOL\_DECREASE_{it}$	Indicator variable coded equal to one if the value of the NOL carry-forward (*tlcf*) decreased in year t
$PRED\_SHELTER_{it}$	Predicted value from the following logit regression presented in column (5) of Table 4 in Lisowsky (2010): $TaxShelterIndicator_{it} = 8.502 + 0.136 \cdot BTD_{it} + 0.424 \cdot DAP_{it} - 0.671 \cdot Leverage_{it} + 1.311 \cdot Size_{it} + 2.425 \cdot ROA_{it} + 8.673 \cdot ForeignIncome_{it} - 1.026 \cdot R\&D_{it} + 1.039 \cdot TaxHaven_{it} + 0.017 \cdot GAAPETR_{it-1} + 0.969 \cdot EqEarn_{it} - 0.731 \cdot MezzFin_{it} + 3.008 \cdot Big5_{it} + 0.952 \cdot Litigation_{it} + 0.100 \cdot NOL_{it}$ Prediction values are bound between zero and one by construction. See Table 2 of Lisowsky (2010) for additional details and variable definitions.
$PTFCF_{it}$	Pretax free cash flows, defined as the ratio of (operating cash flows (oancf) − capital expenditures (*capx*) + cash taxes paid (*txpd*)) to total assets (*at*)
$PTROA_{it}$	Pretax book income (*pi*) deflated by total assets (*at*)
RD_{it}	Natural log of one plus research and development expense (*xrd*). Missing values are reset to zero for 19,310 observations.
RD_CREDIT_{it}	Indicator variable set equal to one if a firm mentions the R&D credit within its Form 10-K (following Hoopes 2015 and Laplante et al. 2015)
$SIZE_{it}$	Natural log of one plus total assets (*at*)
$TURNOVER_{it}$	Indicator coded equal to one when the CEO leaves the firm in year t, and coded zero otherwise (source: Execucomp)
$\Delta MASCORE3_{it}$	Difference between the sum of $MASCORE_{it}$ in $t+1$ through $t+3$ and the sum of $MASCORE_{it}$ in $t-3$ through $t-1$
$\#HAVENS_{it}$	Natural log of one plus the number of tax havens in which a firm reports material operations on its Exhibit 21 (following Dyreng and Lindsey 2009)

Notes. This appendix describes in detail the dependent and independent variables used in our empirical tests. All variable source names in parentheses refer to Compustat unless otherwise stated. The subscript $i(t)$ refers to firm i (year t).

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