

# Corporate In-house Human Capital Investment in Tax Planning\*

Xia Chen  
Qiang Cheng  
Travis Chow  
Yanju Liu

Singapore Management University

January 2016

## Abstract

In-house human capital investment in the tax function is a significant input to a firm's tax planning. Yet, due to lack of data, there is little empirical evidence on whether corporate in-house tax departments are associated with effective tax planning. We examine this issue using hand-collected data on corporate tax employees in S&P1500 firms. We find that firms with larger in-house tax departments are more effective in tax planning: they have lower tax rates, report lower uncertain tax benefits, and exhibit less volatile tax rates. The results are stronger for firms with in-house tax departments that have a higher proportion of senior or longer-tenured tax professionals. Overall, this paper contributes to the literature by looking inside the "black box" of corporate tax departments.

**Keywords:** Human Capital, Tax Planning, Tax Avoidance, Tax Risk

**JEL Classifications:** J24, H25, H26

---

\* We are grateful for the helpful comments and suggestions from Ashiq Ali, Joy Begley, Katherine Drake, Alex Edwards, Joy Embree, Fabio Gaetner, Stacie Laplante, Kin Lo, Dan Lynch, Terry Shevlin, Terry Warfield, Han Yi, Liandong Zhang, workshop participants at University of British Columbia, City University of Hong Kong, University of Hong Kong, KAIST, Korea University, University of Melbourne, Singapore Management University, Tsinghua University, and University of Wisconsin-Madison, and conference participants at the AAA Annual Meeting 2015, AAA FARS Midyear Meeting 2016, and the SMU Accounting Symposium. We thank Lianghua Huang for excellent research assistance and the School of Accountancy Research Center (SOAR) at Singapore Management University for financial support. Chen and Cheng gratefully acknowledge funding from the Lee Kong Chian Fellowship, and Liu thanks the Sing Lun Fellowship for financial support. Authors' contact information: [xchen@smu.edu.sg](mailto:xchen@smu.edu.sg) (Xia Chen), [qcheng@smu.edu.sg](mailto:qcheng@smu.edu.sg) (Qiang Cheng), [travischow@smu.edu.sg](mailto:travischow@smu.edu.sg) (Travis Chow), and [yjliu@smu.edu.sg](mailto:yjliu@smu.edu.sg) (Yanju Liu).

## 1 Introduction

In this study, we investigate how a direct input into corporate tax planning—firms’ in-house tax departments—affects tax planning outcomes. Building up an in-house tax department is an important way to achieve tax compliance and planning objectives.<sup>1</sup> Based on a survey conducted by the Office of Tax Policy Research, Slemrod and Venkatesh (2002) report that internal personnel costs constitute the main tax-related expenditure, accounting for 58.7% of the total tax-related expenditure, with the rest attributed to internal non-personnel costs (16.5%) and external tax services (24.8%). Other studies using data from different surveys draw similar inferences. For example, Mills et al. (1998) and Dunbar and Phillips (2001) find that in-house tax spending is two to three times higher than external tax spending.<sup>2,3</sup> Despite the significance of internal tax investments, there is limited evidence on how they affect tax planning outcomes.

The primary reason for the limited evidence is the lack of data. We circumvent this problem by using a novel dataset of corporate tax employees for a large sample of U.S. firms. Specifically, we hand-collect information on the tax employees in S&P1500 firms from the employees’ self-posted profiles on *LinkedIn*, the world’s largest professional networking website. The data allow us to infer not only the size of a firm’s in-house tax department, but also characteristics such as the seniority, tenure, work experience, and educational background of the employees.

A well-resourced in-house tax department can improve a firm’s tax planning through channels such as the better identification of tax planning opportunities, tighter coordination, better information sharing within the firm, and more in-depth knowledge to transform tax

---

<sup>1</sup> Our focus is on the in-house tax department. In the empirical analyses, we control for external tax services.

<sup>2</sup> In terms of magnitude, Slemrod and Blumenthal (1996) estimate that the total annual cost of income tax compliance for 1,300 large corporations amounts to \$2.08 billion, or \$1.57 million per firm. About 31% is related to state tax compliance and the other 69% is related to federal tax compliance.

<sup>3</sup> Internal personnel costs include salaries and fringe benefits, while internal non-personnel costs include items such as software, record keeping, and travel.

planning opportunities into tax savings (Gallemore and Labro 2015). Anecdotal evidence suggests that corporate tax departments play a crucial role in tax planning. For example, General Electric's tax department, which is well known for its size, skills, and the practice of hiring former government officials, is renowned for inventing ways to lower the firm's tax bill (Fortune 2011). However, prior studies also suggest that corporate tax departments primarily serve as the gatekeeper of firms' tax risk exposure, with the main focus on tax compliance or tax risk management rather than strategic tax planning (Dunbar and Phillips 2001; Donohoe, McGill, and Outslay 2014).<sup>4</sup> Therefore, the effect of in-house tax investment on tax planning outcomes is an empirical question. We examine this issue by focusing on two dimensions of tax planning—tax avoidance and tax risk—and thus provide a more comprehensive understanding of the effect of in-house tax investment.

In the main analyses, we use the size of a firm's in-house tax department (i.e., the total number of tax analysts, managers, and executives) to proxy for its in-house human capital tax investment. This proxy reflects whether the firm has a *sufficient* number of personnel with *adequate* tax knowledge. We first examine the association between the size of in-house tax departments and tax avoidance, which we define as the reduction in explicit taxes, in accordance with Hanlon and Heitzman (2010). Because some firm characteristics might affect both tax investment and tax planning outcomes, such as through tax saving opportunities, we use two design choices to address the issue of potential correlated omitted variables. First, we include a comprehensive list of variables that previous research suggests affect tax planning outcomes. Second, we use an instrumental variable (IV) approach to address the potential endogeneity of in-house tax spending. Under the IV approach, we first predict the size of the in-house tax department using an instrumental variable—the number of

---

<sup>4</sup> Mills (1996) defines tax compliance as activities related to fulfilling the requirements of the tax law, including bookkeeping, research, filing the tax return, examination, appeal, and litigation.

graduate tax programs in the state of the firm's headquarter—along with other variables. In the second stage, we use the predicted size of the in-house tax department to explain tax planning outcomes. We believe that together, these two design choices largely address the potential endogeneity concern.

Our final sample includes 1,021 firms that employ 6,267 tax professionals in their income tax departments. Using the cash effective tax rate (cash ETR) as our main proxy for tax avoidance, we find that firms with larger in-house tax departments exhibit greater tax avoidance, after controlling for industry fixed effects and a number of firm characteristics that may affect firms' tax rate.

Next, we examine the effect of corporate tax departments on tax risk, which we define as a firm's uncertainty regarding its tax liability in tax positions (Gallemore and Labro 2015). Our main proxy for tax risk is unrecognized tax benefits (UTB) under FIN 48 (Rego and Wilson 2012; Beck and Lisowsky 2014). We predict and find a significant negative association between firms' in-house tax department size and their level of UTB, suggesting that firms with larger in-house tax departments view their tax positions to be less uncertain and more likely than not to sustain a tax audit.

Prior research suggests that executives are concerned about not only the cash effect, but also the book effect, of tax planning (Dyreng, Hanlon, and Maydew 2010; Armstrong, Blouin, and Larcker 2012; Graham, Hanlon, Shevlin, and Shroff 2014). Therefore, we also examine the effect of in-house tax departments on GAAP effective tax rates (ETR) and book-to-tax differences (BTD). In terms of tax risk, we follow the recent literature and use the volatility of cash and GAAP ETRs as alternative measures of tax risk (Guenther, Matsunaga, and Williams 2013; McGuire, Neuman, and Omer 2013). We also use the amount of tax settlements (deflated by total assets) as an alternative proxy for tax risk (Bauer and Klassen 2014; Saavedra 2015). The inferences based on these additional measures are the same: firms

with larger in-house tax departments have significantly lower GAAP ETR and significantly higher BTD, consistent with more aggressive tax planning; these firms also have lower amount of tax settlements and less volatile cash and GAAP ETRs, consistent with a lower tax risk. Together, these findings indicate that firms that invest more in their in-house tax departments are more effective in tax planning: they save more taxes and have lower tax risks.

Utilizing the richness of our data, we also examine whether the effect varies with the composition of the tax department. We find that an in-house tax department with a higher proportion of senior tax professionals (managers and above) is more effective in tax planning. In contrast, a larger tax department is not necessarily more effective in tax planning if the majority of the employees are junior tax professionals (i.e., tax analysts). We also find that an in-house tax department is more effective in tax planning if its tax professionals on average have a longer tenure with the company. These findings are consistent with the notion that more senior employees and employees with a more thorough understanding of the firm perform better at tax planning related tasks (Magro and Nutter 2012).

This study contributes to the literature in several important ways. First, to the best of our knowledge, this study is the first to look inside the “black box” of corporate tax departments. Previous studies have investigated the link between external tax services and tax planning (e.g., McGuire, Omer, Wang 2012; Dhaliwal, Gal-Or, Naiker, and Sharma 2013). However, there is limited research on the implications of in-house tax spending because of the “difficulties in quantifying firms’ input in tax planning due to limited archival data” (Klassen, Lisowsky, and Mescall 2015). Our study overcomes this limitation by using detailed archival data on corporate tax departments (size, composition, and experience) to provide a comprehensive analysis of the effect of in-house tax investment on both tax avoidance and tax risk. We also provide detailed descriptive statistics on the educational

background and work experience of more than 6,000 tax employees at the individual level.

Second, the findings of this study contribute to our understanding of the cross-sectional determinants of tax avoidance and tax risk. Shackelford and Shevlin (2001) emphasize that it is critical to understand the organizational factors that affect tax avoidance. Several recent studies provide archival and survey evidence on the influence of factors such as ownership structure, the performance measurement of corporate tax departments, and the compensation structure of business unit managers, tax directors, and executives (e.g., Phillips 2003; Chen, Chen, Cheng, and Shevlin 2010; Robinson, Sikes, and Weaver 2010; Armstrong et al. 2012; Rego and Wilson 2012; Gaertner 2014; Powers, Robinson, and Stomberg 2015). Our study complements this stream of literature by demonstrating the importance of in-house tax investment, a direct input in the tax planning process, for tax planning outcomes. Our finding that firms with larger in-house tax departments have less uncertain tax positions and less volatile tax rates demonstrates the importance of in-house tax functions in tax risk management, thus contributing to the emerging literature on tax risk and its determinants (Guenther et al. 2013; McGuire et al. 2013; De Simone, Mills, and Stomberg 2014).

Our study is closely related to, but greatly extends Mills, Erickson, and Maydew (1998), which provides early evidence on the negative association between tax investment and ETR using survey data from 365 firms. We extend their study in two important ways. First, we examine a much larger sample (S&P1500 firms) in a recent period, when the in-house tax function likely plays a greater role in tax planning due to the transformation of the regulatory environment (Maydew and Shackelford 2007; Dell'Anna and Staubli 2008; Donohoe and McGill 2011).<sup>5</sup> Second, we examine the relationship between various characteristics of in-house tax departments and a broad set of tax attributes, including both

---

<sup>5</sup> For example, Donohoe and McGill (2011) find that investors believe that Schedule M-3, which imposes higher disclosure requirements on firms' book-tax gap, would increase future tax burden and/or tax compliance costs.

tax avoidance and tax risk. Thus, our findings not only enhance the understanding of the effect of corporate tax departments on tax avoidance, but also provide new empirical evidence on the increasingly important role of corporate tax departments in managing tax risk (Donohoe et al. 2014).

We conclude our introduction with several caveats. First, while our dataset covers a large number of firms and contains detailed data on individual employees working in the corporate tax functions, one limitation is that it presents only a snapshot of the firms' tax departments at the time of data collection in 2014. Due to this limitation, our results might not be generalizable to other years, although we do not have strong reasons to believe that 2014 is a unique year in this regard. We are also unable to examine the relation between in-house tax department size and tax planning over time, which is an important research question given the downward trend in U.S. firms' effective tax rates (Dyreng, Hanlon, Maydew, and Thornock 2015). We leave this for future research when longer time-series data become available. Second, our analyses focus on the benefits of having a large in-house tax department—reducing tax rates and tax risk. We do not attempt to measure the costs of having a large in-house tax department or the costs of tax planning such as reputational costs. As such, our analyses cannot be used to infer the optimality of in-house tax department size. Finally, like many empirical studies on corporate tax avoidance, we do not consider implicit taxes. Our findings only illustrate the implications of corporate tax departments for explicit taxes.

The remainder of this paper is organized as follows. Section 2 discusses the related literature and develops the hypotheses. Section 3 describes the data and empirical design. Section 4 presents the main analyses and Section 5 the additional analyses. Section 6 concludes.

## 2 Literature Review and Hypothesis Development

### 2.1 Related Research

Firms engage in various tax planning activities to reduce their tax liabilities (Shackelford and Shevlin 2001; Hanlon and Heitzman 2010). Tax planning activities range from simple planning such as the use of tax-favored municipal bond investments, to cross-border tax strategies involving foreign or multi-state planning, to more aggressive strategies such as tax shelters (e.g., Dyreng and Lindsey 2009; Brown 2011; Lisowsky 2010; Klassen and Laplante 2012; Dyreng, Lindsey, and Thornock 2013; Lisowsky Robinson, and Schmidt 2013). While the amount of tax savings generated from tax planning can be substantial,<sup>6</sup> the reasons why some firms avoid more taxes than others are not well understood.

One reason that is often cited in the press is the complexity of the tax codes and the associated high compliance costs. Firms might forgo tax planning opportunities because of tax complexity (McKinnon 2012). This is especially true for small- and medium-sized companies due to their limited resources. Even large firms have raised concerns that the cost of tax compliance has exhausted their tax planning resources. In a hearing before the U.S. House of Representatives, Mark Schichtel, Senior Vice President and Chief Tax Officer for Time Warner Cable, expressed frustration that “we have to spend so much just to comply with the law, not even optimizing, I am just talking basic compliance... I can’t imagine what it is like for companies that don’t have the kind of resources that we have” (U.S. House of Representatives 2013). In her response to Mark Schichtel’s comment, Professor Michelle Hanlon pointed out that small firms have a very hard time with tax complexity and planning

---

<sup>6</sup> For example, Graham and Tucker (2006) estimate that the median amount of tax deduction associated with the use of tax shelters is more than \$1 billion per firm per year, or about 9 percent of total assets for the 24 firms in their study. Using confidential reportable transaction data from the IRS Office of Tax Shelter Analysis, Lisowsky et al. (2013) find that the 48 firms in their sample used reportable transactions to reduce taxable income by a total of \$10.7 billion (7.5 percent of taxable income) in 2007.

because they may not even have an internal tax department.

These discussions suggest that in the presence of tax complexity, devoting firms' resources to internal tax departments can make a significant difference in tax planning outcomes. However, there is little empirical evidence on the association between firms' in-house tax departments and tax planning due to the lack of archival data. One notable exception is Mills et al. (1998). Using survey data on 365 firms in 1993, Mills et al. (1998) find that firms' total tax spending (as a percentage of SG&A) increases with foreign operations, capital intensity, and the number of legal entities, and decreases with firm size, consistent with tax investment being explained by tax complexity and economies of scale in tax planning. The authors also find that a firm's ETR is negatively correlated with its overall tax-related expenditure.

Our study is related to, but distinct from, several studies on the role of external tax services in firms' tax avoidance. For example, McGuire, Omer, and Wang (2012) find that audit firms with tax-specific industry expertise can help their clients to achieve significant tax savings. Dhaliwal, Gal-Or, Naiker, and Sharma (2013) document a positive association between the tax planning component of tax fees paid to the auditor and the client firm's tax avoidance. They also find that the association is stronger for the client firms that obtain both tax planning and tax compliance services from the auditor, consistent with a knowledge spillover effect. Different from these two studies, our focus is on the implication of *in-house* tax investment for tax planning, on which there is limited evidence.

Our study is also related to Jiang, Robinson, and Wang (2015) and Klassen et al. (2015). Using *LinkedIn* to identify the firms that hire former Internal Revenue Service (IRS) employees, Jiang et al. (2015) find that the hiring of former IRS employees is associated with greater tax avoidance but such "revolving door hires" are also associated with increased subsequent settlement and penalties. Klassen et al. (2015) use confidential data from the IRS

to examine the association between the party signing the tax returns and tax planning. They find that firms whose tax returns are signed internally (rather than by external tax preparers) are more likely to engage in aggressive tax planning and, at the same time, claim uncertain tax positions more frequently. Our study differs from these two studies in that we are interested in how the overall in-house tax department and its characteristics (such as its composition) influence firms' tax planning, rather than focusing on individuals with specific backgrounds (e.g., IRS work experience) or comparing the effect of different parties signing the tax returns (e.g., external vs. internal preparers).

## *2.2 Association between In-House Tax Investment and Tax Avoidance*

A well-staffed in-house tax department can facilitate a firm's tax avoidance through channels such as better identification of tax saving opportunities, better coordination and information sharing with the other units of the firm, and more in-depth knowledge to transform tax saving opportunities into actual tax savings. Prior studies provide supportive evidence that such factors can facilitate tax avoidance. For example, Bauer (2015) and De Simone, Ege, and Stomberg (2015) document that a significant number of tax-related internal control material weaknesses result from resource constraints such as an insufficient number of personnel with adequate tax knowledge. Bauer (2015) finds that tax-related material weaknesses negatively affect firms' ability to reduce taxes, resulting in higher cash ETR and GAAP ETR. Lynch (2014) further finds that the remediation of such material weaknesses, either through hiring outside consultants or recruiting internal personnel, increases firms' future tax avoidance. Gallemore and Labro (2015) argue that information sharing and coordination across divisions within a firm is important for effective tax planning, and find that firms with better internal information quality have lower cash ETR and lower tax risk.

The above discussion suggests that having a well-staffed in-house tax department should enable firms to be more effective in saving tax, leading to a positive association between in-house tax investment and tax avoidance. Our first hypothesis is thus stated (in alternative form):

***H1:*** *Firms' in-house human capital investment in tax planning is positively associated with tax avoidance.*

Notwithstanding these arguments, a firm's in-house tax investment and its tax avoidance might not be positively correlated for several reasons. First, McGuire et al. (2012) suggest that in-house tax professionals are less sophisticated than external tax service providers such as industry tax experts. Certain tax strategies may be difficult to implement in-house and therefore firms often rely on accounting, law, or tax consulting firms to undertake such activities (Wilson 2009; Lisowsky 2010; Brown 2011; Lisowsky et al. 2013).<sup>7</sup> In equilibrium, it is possible that firms that are more in need of sophisticated tax planning strategies choose to outsource instead of conducting in-house tax planning, in which case tax planning outcomes may not correlate with in-house tax investment.<sup>8</sup> Second, previous studies (e.g., Dunbar and Phillips 2001; Donohoe et al. 2014) and some practitioners suggest that corporate in-house tax functions focus primarily on compliance-related activities including tax risk management, and less on strategic tax planning (TEI 2012; Mendola 2014).

Therefore, a larger in-house tax department may simply reflect the higher amount of tax compliance work and is not necessarily related to tax avoidance. In sum, whether firms' in-

---

<sup>7</sup> Graham et al. (2014) document that more than 83% of their sample firms have been marketed at least one tax strategy by a tax shelter promoter, suggesting that tax strategy marketing is a pervasive phenomenon. Certain tax strategies were "exclusive" to some tax consulting firms because tax strategy patents were granted in the U.S. until President Obama signed laws banning tax strategy patents in September 2011.

<sup>8</sup> Although firms' decision between establishing an in-house tax department versus outsourcing tax planning is an interesting issue (Dunbar and Phillips 2001; Neuman, Omer, and Thomson 2014), we do not examine this issue in our paper due to the lack of data on firms' overall outside tax spending. In the empirical analysis, we explicitly control for the effect of one source of external tax services—auditor-provided tax services—by including tax fees paid to the auditor in the regressions. While our research design attempts to address the concern of omitted correlated variables using an IV approach, we acknowledge that it is not possible to control for the total spending on external tax services because there are no available data on external non-auditor-provided tax services.

house tax investment is positively correlated with tax avoidance is an empirical question.

### 2.3 *Association between In-House Tax Investment and Tax Risk*

The concept of tax risk is recently introduced in the academic literature. Guenther et al. (2013) define a low tax risk as a firm's ability to sustain its tax positions over time or as low uncertainty about a firm's tax rate. McGuire et al. (2013) introduce a similar concept, tax strategy sustainability, which is defined as maintaining consistent tax avoidance outcomes over time. Using the standard deviation of cash ETR to proxy for tax risk, Guenther et al. (2013) and McGuire et al. (2013) find that tax risk is positively associated with future stock return volatility and negatively associated with earnings persistence, consistent with the notion that tax risk increases the volatility of cash flows and earnings. Using survey data, Dichev, Graham, Harvey, and Rajgopal (2013) also find that the fluctuation in ETR is cited as one of the factors that impairs earnings quality.

Gallemler and Labro (2015) define tax risk as a firm's uncertainty regarding the liability of a tax position. Using an analytical framework, Mills et al. (2010) show that firms with strong supporting facts can credibly signal to the tax authority that they possess strong facts for their tax position by reporting a lower UTB. As a result, firms with a strong position will be subject to a lower probability of a tax audit, leading to higher expected payoffs. Recent empirical studies (Bauer and Klassen 2014; Saavedra 2015) suggest that unfavorable tax settlements with the tax authority increase cash flow volatility, are negatively valued by the market, and are associated with negative consequences in the debt market in the form of higher loan spreads and more restrictive contracting terms. Therefore, firms have incentives to reduce their tax risk.

We argue that the in-house tax department serves as the primary gate keeper of a firm's tax risk exposure because its key role is to provide high-quality tax compliance work, which

can lead to a lower tax risk. For example, Dunbar and Phillips (2001) and Donohoe et al. (2014) find that in-house tax departments focus primarily on tax compliance and less on strategic tax planning. A recent survey by the Tax Executives Institute of 500 chief tax officers around the world reports that the top three measures used to evaluate a corporate tax department's performance are "lack of surprises" (72%), "the results of audits" (60%), and "meeting compliance deadlines" (59%) (TEI 2012).<sup>9</sup> In an interview with CFO Magazine, Mark Mendola, the U.S. tax leader of a Big 4 accounting firm, points out that in-house tax departments traditionally focus on identifying, analyzing, and mitigating tax risk (Mendola 2014). Accordingly, firms with more in-house tax employees will be more effective in tax risk reduction related compliance work such as research, examination, and documentation to fulfill the tax law requirements. With more effective documentation and research, these firms possess strong supporting facts regarding their tax positions and can present such facts upon request by the tax authority. Hence, we predict that firms with larger in-house tax departments assume less uncertainty when they enter into a tax position (Frischmann, Shevlin, and Wilson 2008; Mills et al. 2010; Rego and Wilson 2012).<sup>10</sup> We also predict that the tax positions claimed by such firms are less likely to be overturned by the tax authority, leading to less volatile tax rates (Saavedra 2015).

The above discussion leads to our second hypothesis (in alternative form):

***H2: Firms' in-house human capital investment in tax planning is negatively associated with tax risk.***

---

<sup>9</sup> The tax planning measures "cash taxes" (57%) and "effective tax rates" (53%) rank fourth and fifth, respectively, among the most common performance measures. An earlier survey by Ernst and Young documented a similar finding that "tax risk management" (75%) has become a more important performance measure for tax directors than "cash flow impact" or "effective tax rate" (Ernst and Young 2004).

<sup>10</sup> It is also possible that firms with larger in-house tax departments take a more conservative approach to managing tax risk by over-reporting UTB. Hence, it is an empirical question whether the size of the in-house tax department is negatively associated with tax risk as measured by UTB.

### 3 Data and Research Design

#### 3.1 Data and Sample

We obtain data on corporate tax employees from *LinkedIn*, a professional networking website with over 300 million members worldwide. It hosts the homepages of more than three million firms. Due to the cost of data collection, we focus on S&P1500 firms. We first manually search for the *LinkedIn* homepage of each firm in 2014, which results in 1,378 unique firms. We exclude 298 firms in financial service industries (SIC 6000-6999) because the tax planning strategies of financial firms are quite different from those of other firms, resulting in 1,080 unique firms. For each of these firms, we then hand collect the profiles of the employees working in the accounting function. Lastly, we match the *LinkedIn* data to the firm-level COMPUSTAT financial data for the most recent fiscal year (2014). The final sample consists of 1,021 firms in 2014. The sample size used for the individual regressions might be smaller due to additional data requirements for regression variables.

To separate employees working in the tax function from those in the accounting function, we search for employees with the word “tax” in their current job titles. To identify their positions, we use keywords such as “director,” “manager,” “counsel,” “consultant,” “attorney,” and “analyst.” We also extract information regarding the tax employees’ educational background, professional accounting accreditation (e.g., CPA or CA), and work experience. Because we focus on tax professionals’ contribution to tax planning, we perform a careful check of the job titles and exclude (i) tax employees with job titles that are not related to corporate income tax functions (such as titles related to property and payroll taxes) and (ii) tax employees who are less likely to contribute to tax planning at the corporate level or whose jobs are temporary in nature (such as “clerk” and “intern”).

The most important concern related to our measure of in-house tax departments is the comprehensiveness of the information provided on *LinkedIn*; in other words, whether most of

the tax employees in our sample firms have a *LinkedIn* account. We believe that the *LinkedIn* coverage is fairly comprehensive. A study by BrightEdge, a marketing firm, concludes that “9 out of the top 10 brands with the most followers on *LinkedIn* have at least 60% of their employees on *LinkedIn*.” The percentage could be higher for tax professionals. For our sample of S&P1500 firms, the average number of tax employees (in the income tax function) is 6.14. If the sample is restricted to S&P500 firms, the average number of tax employees is 10.85. This number is comparable to a recent survey completed by 500 chief tax officers around the world, which reports an average of 10.6 tax employees for the largest companies from the U.S., Canada, Europe, and Asia (TEI 2012). While we believe that our data coverage is comprehensive, we acknowledge that potential data incompleteness may introduce noise into our tests. However, we do not have strong reasons to believe that it introduces systematic bias into our analyses.<sup>11</sup>

### 3.2 *Measures of In-house Human Capital Investment in Tax Planning*

We measure a firm’s in-house human capital investment in tax planning by the size of its in-house tax department, calculated as the total number of in-house tax employees (*TAX\_EMPLOYEES*), including tax analysts and more senior tax professionals such as tax managers and executives. This measure captures whether the firm has a sufficient number of personnel with adequate tax knowledge. Specifically, tax analysts include employees with job titles such as “Tax Analyst,” “Tax Specialist,” “Corporate Tax Accountant,” and “Tax Associate;” tax managers include those with titles such as “Tax Manager,” “Senior Tax Lawyer,” “Tax Attorney,” and “Global Tax Accounting Manager;” and tax executives include those with titles such as “Tax Director,” “Vice President-Tax,” “Chief Tax Counsel,” and “International Tax Counsel.”

---

<sup>11</sup> One concern is that the likelihood of tax employees registering on *LinkedIn* might vary across industries. To address this potential issue, we include industry fixed effects in all regressions.

Table 1 presents the characteristics of the employees working in the in-house tax departments. There are 6,267 tax employees in our sample of 1,021 firms, including 3,411 senior tax professionals (1,470 tax executives and 1,941 managers) and 2,856 junior tax employees (i.e., tax analysts). About 55% of the tax employees have an undergraduate degree in accounting. It is also quite common for them to pursue a graduate degree: 27% have a tax graduate degree, 11% have a law degree, and 31% have a graduate degree in business (other than tax and law). The proportion of tax employees with a CPA or CA designation is 22%. In terms of work experience, we note that only 1 percent of the tax professionals have had work experience in the IRS. In contrast, 18% of tax professionals have worked in other corporate tax departments (at the manager level or higher) and 36% have Big N experience (including 1% who have become partners and 14% who have become managers).

In Table 1, the p-values of the statistical tests comparing senior and junior tax employees suggest that the two groups differ significantly in terms of graduate education and work experience. For example, in terms of education, the proportions of employees with graduate degrees in tax or law are much higher among senior tax professionals; in terms of work experience, the proportions of employees who have worked for the IRS, other corporate tax departments, or Big N firms are also significantly greater among senior tax professionals.

Consistent with previous research (Slemrod and Blumenthal 1996; Slemrod and Venkatesh, 2002), we find that in-house tax department size is positively correlated with firm size, whether firm size is proxied for by total number of employees (Pearson correlation is 0.337) or total assets (Pearson correlation is 0.772). To address the size effect, in the regressions we use *INHOUSE\_TAX*, defined as the number of tax employees divided by the firm's total number of employees (in thousands).

### 3.3 Measures of Tax Avoidance and Tax Risk

We define tax avoidance as the reduction in explicit taxes (Hanlon and Heitzman 2010). Our main proxy for tax avoidance is cash ETR (*CashETR*), which captures the actual amount of cash taxes paid in relation to book income. To mitigate measurement issues related to a single-year measure, we use a three-year cash ETR measure, calculated as the sum of a firm's total cash taxes paid over a three-year period divided by the sum of its total pre-tax book income net of special items over the same period (Dyreng, Hanlon, and Maydew 2008).

In addition to cash ETR, we use GAAP ETR (*ETR*) and total book-tax difference (*BTD*) to capture tax avoidance, providing corroborative results and additional insights into the effectiveness of corporate tax departments. Relying on survey data, Graham et al. (2014) document that the top management in U.S. public firms cares not only about the cash effect, but also about the book effect of tax planning. Consistent with managers' concerns about the cash and book effect of tax planning, Dyreng et al. (2010) document significant effects of top executives' compensation structure on both GAAP and cash effective tax rates. In terms of BTD, Mills (1998) finds that the number of IRS-proposed adjustments increases with a firm's BTD, consistent with the notion that firms with a larger BTD are associated with greater tax avoidance and a larger BTD is viewed as a red flag for the IRS. Recent research also validates that total BTD is useful in predicting aggressive tax planning (Wilson 2009; Lisowsky 2010). Thus, cash ETR, GAAP ETR, and BTD are the most appropriate proxies for tax avoidance in our setting because they best capture what top management considers as representative measures of effective tax planning. Similar to *CashETR*, we use a three-year period to construct *ETR* and *BTD*. Our results are robust to using single-year or five-year proxies.

Our main proxy for tax risk is a firm's balance of unrecognized tax benefits (UTB) (Rego and Wilson 2012; Beck and Lisowsky 2014). We choose UTB as the main proxy for

tax risk because it represents the amount of income tax associated with uncertain tax positions (Frischmann et al. 2008; Rego and Wilson 2012; Beck and Lisowsky 2014). To be consistent with the way we measure tax avoidance, we calculate *UTB* as the three-year average of the firm's ending balance of *UTB*, divided by average total assets over the same period.

Meanwhile, prior research suggests that *UTB* reflects both the aggressiveness of the tax position and the firm's financial reporting of the position (Hanlon and Heitzman 2010; Beck and Lisowsky 2014). To provide corroborative evidence, we use three additional proxies to capture tax risk, as suggested in the literature. First, we use the amount of tax settlements (deflated by total assets) to measure tax risk. Previous research finds that tax settlements increase the volatility of cash flow and are unfavorably viewed by market participants (Bauer and Klassen 2014; Saavedra 2015). Second, we use the volatility of cash *ETR* and the volatility of GAAP *ETR* (Guenther et al. 2013; McGuire et al. 2013) as proxies for tax risk. The volatility of cash *ETR* (*SD\_CashETR*) is calculated as the standard deviation of annual Cash *ETR* over a three-year period, and similarly for the volatility of GAAP *ETR* (*SD\_ETR*).<sup>12</sup> As the four proxies of tax risk reflect different dimensions of tax risk, obtaining similar results based on these proxies can increase our confidence in the inferences.

### 3.4 Regression Specification

To test H1 and H2, we estimate the following regression:

$$\begin{aligned}
 TAX\_AVOID \text{ or } TAX\_RISK = & \beta_0 + \beta_1 INHOUSE\_TAX + \beta_2 SIZE + \beta_3 ROA \\
 & + \beta_4 MTB + \beta_5 LEV + \beta_6 PPE + \beta_7 R\&D + \beta_8 INTANG + \beta_9 FI \\
 & + \beta_{10} FOREIGN + \beta_{11} NOL + \beta_{12} TAX\_FEES + \beta_{13} ICW \\
 & + Industry\ Fixed\ Effects + \varepsilon
 \end{aligned} \tag{1}$$

---

<sup>12</sup> We use a three-year period, instead of a longer period, to measure these variables to retain a larger sample. Analyses using a longer period (such as four or five years) to calculate *SD\_CashETR* and *SD\_ETR* lead to qualitatively similar results.

The dependent variable, *TAX\_AVOID* (*TAX\_RISK*), is one of the proxies for tax avoidance (tax risk), as discussed earlier. The independent variable of interest, *INHOUSE\_TAX*, is the proxy for the size of the in-house tax department. Following previous research, we include a number of firm characteristics shown to be associated with tax planning opportunities and outcomes (Dyreg et al. 2008; Robinson et al. 2010; Gallemore and Labro 2015; Klassen et al. 2015). Specifically, we control for firm size (*SIZE*) as measured by total assets, profitability (*ROA*), market-to-book ratio (*MTB*), leverage (*LEV*), property, plant, and equipment (*PPE*), R&D activities (*R&D*), intangibles (*INTANG*), income from foreign operations (*FI*), an indicator for foreign operations (*FOREIGN*), the presence of loss carrying forward (*NOL*), tax fees paid to the auditor (*TAX\_FEES*), the presence of internal control weakness in internal control (*ICW*), and industry fixed effects. Following Guenther et al. (2013), we include the volatility of pre-tax book income (*SD\_PTBI*) as an additional control variable in regressions of tax rate volatility. The Appendix provides the variable measurements.

An important issue is that tax planning investment (as measured by the size of the in-house tax department) is likely to be endogenously determined. While we argue that the size of a firm's in-house tax department affects tax avoidance and risk, it is also likely to be affected by firm characteristics (Mills et al. 1998; Dyreg et al. 2008; Klassen et al. 2015), executive characteristics (Dyreg et al. 2010; Chyz 2015; Law and Mills 2015), and the amount of tax compliance and planning work desired by the firm. This gives rise to omitted correlated variable problems and hence the ordinary least squares (OLS) estimations may be biased.<sup>13</sup> We include a comprehensive list of control variables, including industry fixed effects, in the regressions to address the omitted correlated variable problems. To further

---

<sup>13</sup> The direction of the bias caused by the endogeneity concern is unclear. For example, it could be argued that firms with fewer tax saving opportunities need to invest more to achieve a low tax rate, biasing against finding results consistent with H1. Alternatively, firms with more tax saving opportunities might invest more to exploit those opportunities, biasing toward finding results consistent with H1.

address the potential endogeneity issue, we use an instrumental variable (IV) approach. We first specify a determinant model of the size of in-house tax department (Equation (2)) and then estimate Equation (1) and (2) together using a GMM estimation:<sup>14</sup>

$$\begin{aligned} INHOUSE\_TAX = & \alpha_0 + \alpha_1 TAX\_EDUCATION + \alpha_2 SIZE + \alpha_3 ROA \\ & + \alpha_4 MTB + \alpha_5 LEV + \alpha_6 PPE + \alpha_7 R\&D + \alpha_8 INTANG + \alpha_9 FI \\ & + \alpha_{10} FOREIGN + \alpha_{11} NOL + \alpha_{12} TAX\_FEES + \alpha_{13} ICW + \varepsilon \end{aligned} \quad (2)$$

The instrumental variable in Equation (2) is *TAX\_EDUCATION*, calculated as the number of graduate tax programs in the state where the firm has its headquarter. The size of a firm's in-house tax department is likely to depend on its access to tax professionals.<sup>15</sup> To capture this access, we hand-collect the number of graduate tax programs (including graduate taxation and tax law programs) offered in the state where the firm's headquarters is located. At the same time, we believe that *TAX\_EDUCATION* does not directly affect a firm's tax planning outcomes (other than through influencing the firm's in-house tax department). In Equation (2), in addition to the instrumental variable we include the control variables from Equation (1).

Note that our measure of in-house tax departments is for 2014. Thus the control variables and the instrumental variable are also measured in 2014 and the tax avoidance and risk measures are measured over the three-year period 2012-2014.

---

<sup>14</sup> This is similar to the approach in Klassen et al. (2015), who adopt a simultaneous multinomial treatment effect model. The same model is not feasible in our setting because our variable of interest, *INHOUSE\_TAX*, is a continuous variable. The generalized method of moments (GMM) estimator possesses merits similar to the estimator from a system of simultaneous equations (Cameron and Trivedi 2005).

<sup>15</sup> To substantiate this statement, we examine tax professionals working for companies with headquarters in two randomly selected states, California and Texas. Of the 320 tax professionals with a tax/law degree currently working for companies headquartered in California (in our final sample), 107 (33%) obtained their tax/law degrees from California. Of the 135 tax professionals with a tax/law degree currently working for companies headquartered in Texas, 48 (36%) obtained their tax/law degree from Texas. These percentages are much higher than the representation of tax/law programs in California or Texas. Only 15.6% and 6.1% of tax/law programs in the U.S. are located in California and Texas, respectively.

## 4 Empirical Results

### 4.1 Descriptive Statistics

Table 2 presents the descriptive statistics on the variables used in the main analysis. On average, firms have six tax employees, comprising 1.44 tax executives, 1.90 tax managers, and 2.80 tax analysts. Note that the distribution of the total number of tax employees is right skewed; the mean (6.14) is greater than the median of 3. *INHOUSE\_TAX* has a mean of 0.696, implying that about 0.07% of firms' employees work in the firms' tax departments.

With respect to tax planning proxies, our sample firms have a mean (three-year average) *Cash ETR* of 25.1% and a mean (three-year average) *UTB* of about 0.853% of total assets.<sup>16</sup> The mean *ETR* is 30.5% and on average *BTD* is about 1.6% of total assets. The mean tax settlement is about 0.065% of total assets. In terms of the volatility of tax rates, the mean standard deviation of *Cash ETR* (*ETR*) is 8.0% (6.7%). These statistics are comparable to those reported previously (e.g., Dyreng et al. 2008; Guenther et al. 2013; McGuire et al. 2013; De Simone et al. 2014; Gallemore and Labro 2015).

On average, the sample firms have total assets of 11,792 million, *ROA* of 10.1%, market-to-book of 3.83, leverage of 23.6% of total assets, *PPE* of 29.6% of total assets, *R&D* of 2.7% of total assets, intangible assets of 26.0% of total assets, and foreign income of 2.8% of total assets. Of the sample firms, 62.0% have positive foreign income, and 43.3% have net losses carried forward. The sample firms, on average, pay 0.579 million in tax fees to their auditors. About 4.5% of the sample firms report material weaknesses in internal control.

Table 3 presents the Pearson correlations among the variables used in the main analysis. *INHOUSE\_TAX* is negatively correlated with *CashETR*, consistent with H1. It is positively correlated with *UTB*, inconsistent with H2. However, the univariate correlations are

---

<sup>16</sup> We multiply *UTB* and *SETTLE* by 100 for the ease of interpreting the regression coefficients.

confounded by correlated factors. Most of the correlations among the control variables are small, except those between *FI* and *FOREIGN* (0.579) and between *PPE* and *INTANG* (−0.439). The test of variance inflation factors indicates that multicollinearity is not a major issue in the regressions. In an untabulated analysis, we calculate the correlations between the different levels of tax employees (*TAX\_EXECUTIVES*, *TAX\_MANAGERS*, and *TAX\_ANALYSTS*). The high correlations between them (around 0.9) indicate that the work of an in-house tax department is coordinated across different ranks.

#### 4.2 Association between In-house Tax Investment and Tax Avoidance: Test of H1

Table 4 presents the results of the test of H1 based on the IV approach, as described above. Column (1) reports the determinant model of in-house tax department size (i.e., Equation (2)). The results show that the coefficient on *SIZE* is significantly negative, indicating that in-house tax employees as a proportion of total employees decreases with firm size (total assets). This is consistent with economies of scale in tax planning (Mills et al. 1998; Slemrod and Venkatesh 2002). With respect to the instrumental variable, the association between *TAX\_EDUCATION* and *INHOUSE\_TAX* is significantly positive, consistent with the conjecture that it is easier for firms headquartered in states with a greater supply of tax graduates to recruit tax employees. The partial F-statistic is 9.21, which is greater than the critical value of 8.96 for one instrument, as reported in Larcker and Rusticus (2010), indicating that our analyses are not subject to a weak instrument problem.

Column (2) reports the effect of in-house tax department on tax avoidance as measured by Cash *ETR*. The coefficient on *INHOUSE\_TAX* is significantly negative ( $t = -5.684$ ). This result indicates that greater in-house tax investment is associated with more tax savings, consistent with H1. The effect is economically significant; moving from the first quartile (0.121) to the third quartile (0.836) of *INHOUSE\_TAX* is associated with a reduction in *Cash*

*ETR* of 1.6%  $[(0.836 - 0.121) \times (-0.023) = -1.6\%]$ .<sup>17</sup>

In sum, the results are consistent with H1 that in-house tax investment is associated with more tax avoidance. We also estimate Equation (1) using OLS regression with *TAX\_EDUCATION* added as a control variable. The untabulated results indicate that the coefficient on *TAX\_EDUCATION* is not statistically significant, further supporting the use of *TAX\_EDUCATION* as an instrument (Larcker and Rusticus 2010; Lennox, Francis, Wang, 2012). In the OLS regression, the coefficient on *INHOUSE\_TAX* is significantly negative, consistent with the IV approach. Note that since the OLS estimation may be subject to endogeneity bias as discussed earlier, we base our hypothesis testing on the IV approach.

#### 4.3 Association between In-house Tax Investment and Tax Risk: Test of H2

Table 5 reports the regression results for tax risk using the main proxy of tax risk – uncertain tax benefits under FIN 48 (*UTB*) – under the IV approach. The results indicate that *INHOUSE\_TAX* is significantly negatively associated with *UTB* ( $t = -2.140$ ). That is, consistent with H2, firms that invest more in their in-house tax departments are associated with a reduction in their tax risk. In terms of economic significance, moving from the first quartile (0.121) to the third quartile (0.836) of *INHOUSE\_TAX* is associated with a reduction in *UTB* of 0.07% of total assets  $[(0.836 - 0.121) \times (-0.099) = -0.07]$ . This is economically significant given that *UTB* has a mean of 0.853% and a median of 0.482% of total assets.

Taken together, the results in Tables 4 and 5 indicate that firms that invest more in in-house tax functions (i.e., by having a larger in-house tax department) avoid more taxes, yet such tax avoidance does not come at the expense of a higher tax risk. Instead, firms that have larger in-house tax departments are better able to lower their tax risk, as demonstrated by their lower FIN 48 tax reserves—they are more confident that their tax positions can

---

<sup>17</sup> The inferences remain the same if we use the natural logarithm of the total number of tax employees in place of *INHOUSE\_TAX*, but include the total number of employees in the regression as a control.

withstand a tax audit.

#### 4.4 Alternative Proxies for Tax Avoidance and Tax Risk

Table 6 reports the results using alternative proxies for tax avoidance and tax risk. For brevity, we only report the second-stage results of the IV regressions. Panel A presents the results using alternative proxies for tax avoidance (*ETR* and *BTD*). The results are consistent with H1; *INHOUSE\_TAX* is associated with lower *ETR* and higher *BTD*. The magnitude of the estimated effect of *INHOUSE\_TAX* on *ETR* is slightly smaller than that of *CashETR* reported in Table 4. Moving from the first to the third quartile of *INHOUSE\_TAX* is associated with a 1.2% decrease in *ETR*  $[(0.836 - 0.121) \times 0.017 = 1.22\%]$ . For *BTD*, moving from the first to the third quartile of *INHOUSE\_TAX* is associated with a 0.43% increase in *BTD*  $[(0.836 - 0.121) \times 0.006 = 0.43\%]$ . This is again economically significant given that *BTD* has a mean of 1.6% and a median of 1.3%. Overall, the empirical results suggest that larger corporate in-house tax departments are associated with greater tax avoidance, consistent with H1.

Panel B presents the results using alternative proxies for tax risk (*SETTLE*, *SD\_CashETR*, and *SD\_ETR*). *INHOUSE\_TAX* is significantly negative in explaining all proxies, implying that as the size of the in-house tax department increases, tax settlements and the volatility of tax rates declines. The size of the coefficient indicates that the effect is economically significant. For example, moving from the first quartile to the third quartile of *INHOUSE\_TAX* is associated with a reduction in *SETTLE* of 0.018%  $[(0.836 - 0.121) \times (-0.025) = -0.018]$ ; note that the mean and median of the settlement amount as a proportion of total assets are 0.065% and 0.010%, respectively. Moving from the first quartile to the third quartile of *INHOUSE\_TAX* is associated with a reduction of 0.79% in *SD\_CashETR*  $[(0.836 - 0.121) \times (-0.011) = -0.79\%]$ ; note that the mean and median of the standard deviation of

Cash ETR are 8.0% and 5.4%, respectively. The magnitude of the effect of *INHOUSE\_TAX* on the standard deviation of GAAP ETR is similar. Hence, the empirical results suggest that larger in-house tax departments are associated with a lower tax risk (i.e., lower *UTB* and lower tax settlements, and less volatile cash and GAAP ETRs), as hypothesized in H2.

## **5 Additional Analyses**

In this section, we exploit the richness of our dataset to provide further insights into the role that in-house tax departments play in tax planning. We first examine how the characteristics of the tax department affect its tax planning. In particular, we focus on two dimensions: the proportion of senior tax professionals (tax managers and above) and the average tenure of tax professionals in the tax department. We then discuss several robustness checks.

### *5.1 Role of the Proportion of Senior Tax Professionals in Tax Departments*

Like most other functions in an organization, a typical in-house tax department consists of employees of different ranks, from analysts (more junior positions) to managers or directors (more senior positions). Generally, more senior tax professionals tend to have more specialized education and training in and more experience of tax planning. Research in an experimental setting indicates that more experienced individuals perform better at analytical reasoning, information processing, and judgment making in tax-related tasks (Magro and Nutter 2012). Indicative of the importance of senior tax professionals in tax planning, we find that a significant portion of senior tax professionals have job descriptions related to tax planning, such as international tax planning and transfer pricing. Such job descriptions decline significantly as we move down to the level of tax analysts. Despite the likely importance of senior tax professionals, their incremental role in tax planning has yet to be

empirically examined.

To better understand this issue, we investigate how the composition of tax departments affects the association between the size of in-house tax departments and tax planning. We create two dummy variables, *HIGH\_SENIOR* and *LOW\_SENIOR*, to indicate in-house tax departments with high and low proportions of senior tax professionals (managers and above). *HIGH\_SENIOR* equals one if the tax department ranks in the top quartile based on the proportion of senior tax professionals in the tax department, and zero otherwise. *LOW\_SENIOR* is defined as one minus *HIGH\_SENIOR*. We then include the interaction of *HIGH\_SENIOR* and *LOW\_SENIOR* with *INHOUSE\_TAX* in Equation (1) to evaluate the effect of senior tax professionals' presence on the effectiveness of the in-house tax function. The difference between the coefficients for  $INHOUSE\_TAX \times HIGH\_SENIOR$  and  $INHOUSE\_TAX \times LOW\_SENIOR$  captures the incremental effect of the senior tax professionals' presence on the performance of corporate tax departments. Note that for the cross-sectional analyses, we use OLS estimations of Equation (1) because the IV approach is not feasible with the interaction terms in the model.

Table 7 presents the regression results. With respect to tax avoidance (*CashETR*), Column (1) shows that the coefficient on  $INHOUSE\_TAX \times HIGH\_SENIOR$  is significantly negative, but that on  $INHOUSE\_TAX \times LOW\_SENIOR$  is insignificant. As reported at the bottom of the table, the difference in the coefficient between the two interaction terms ( $INHOUSE\_TAX \times HIGH\_SENIOR - INHOUSE\_TAX \times LOW\_SENIOR$ ) is significantly negative with a t-statistic of  $-2.609$ , suggesting that the negative effect of the size of the in-house tax department on tax avoidance is more pronounced for firms with a higher proportion of senior tax professionals within the tax department. We find consistent results when using *ETR* and *BTD* as the alternative proxies for tax avoidance (untabulated).

Column (2) presents the results for tax risk using our main tax risk proxy – *UTB*.

Similar to the results in Column (1), while the coefficient on *INHOUSE\_TAX* × *HIGH\_SENIOR* is significantly negative, that on *INHOUSE\_TAX* × *LOW\_SENIOR* is insignificant. The difference between the two coefficients is significant with a t-statistic of -2.953, suggesting that the negative effect of the size of the in-house tax department on tax risk is more pronounced for firms with a higher proportion of senior tax professionals in the department. We obtain similar results using *SETTTLE*, *SD\_CashETR*, and *SD\_ETR* (untabulated).

Taken together, the results in Table 7 show that the performance of corporate tax departments greatly depends on the presence of senior tax professionals. Increasing the size of the tax department is only effective in avoiding taxes and maintaining a low tax risk for those firms with a high proportion of senior tax professionals in the tax department. Our findings are consistent with the notion that more senior individuals perform better at tax-related tasks (Magro and Nutter 2012).

## 5.2 *Role of the Tenure of Tax Professionals*

In this section, we investigate whether the tenure of tax professionals enhances the effectiveness of the in-house tax department in tax planning. We consider tenure because it has been argued that the main benefit of developing an in-house tax department is that the in-house tax employees have a more thorough understanding of the firm's operations and can better facilitate information sharing and coordination with other divisions, compared with outside tax service providers (Gallemore and Labro 2015). Such advantages are likely to increase with the tax professionals' tenure with the company.<sup>18</sup> Therefore, we expect the effectiveness of in-house tax departments in tax planning to increase with the tenure of tax professionals.

---

<sup>18</sup> We do not consider tax employees' tax-related work experience because such experience is highly correlated with the rank of tax employees.

We measure tenure as the number of years a tax professional has worked for the current firm. We then define two indicator variables, *HIGH\_TENURE* and *LOW\_TENURE*.

*HIGH\_TENURE* equals 1 if the tax department ranks in the top quartile based on the average tenure of tax professionals in the tax department, and zero otherwise. *LOW\_TENURE* is defined as one minus *HIGH\_TENURE*. We include the interaction of *HIGH\_TENURE* and *LOW\_TENURE* with *INHOUSE\_TAX* in Equation (1) to evaluate the effect of tax professionals' tenure on the performance of the in-house tax function. The results are reported in Table 8, with Column (1) for *CashETR* and Column (2) for *UTB*.

As reported in Column (1), the coefficient on *INHOUSE\_TAX* × *HIGH\_TENURE* is significantly negative, while that on *INHOUSE\_TAX* × *LOW\_TENURE* is insignificant. The difference between the two coefficients (*INHOUSE\_TAX* × *HIGH\_TENURE* – *INHOUSE\_TAX* × *LOW\_TENURE*) is negative with a t-statistic of –1.484, providing weak evidence that the association between *INHOUSE\_TAX* and *CashETR* is more negative for the in-house tax departments whose tax professionals have longer tenure with the company.

With respect to tax risk (*UTB* in Column (2)), the coefficient on *INHOUSE\_TAX* × *HIGH\_TENURE* is significantly negative. In contrast, the coefficient on *INHOUSE\_TAX* × *LOW\_TENURE* is significantly positive. The difference between the two coefficients is significantly negative with a t-statistic of –3.342. These findings suggest that in-house tax departments with tax professionals with longer tenure are better at managing tax risk. Taken together, our findings suggest, as expected, that the tenure of tax professionals enhances the in-house tax department's ability to avoid taxes and reduce tax risk.

### 5.3 Robustness Checks

First, Jiang et al. (2015) find that employees who have work experience with the IRS are more effective in lowering firms' tax burdens. In an untabulated analysis, we exclude all

the firms with senior tax professionals who used to work for the IRS. The results remain quantitatively similar. That is, our results for senior tax professionals are not driven by tax employees with an IRS background.

Second, as mentioned earlier, the size of a firm's in-house tax department is significantly correlated with the total number of employees and total assets. In an additional analysis (untabulated), we measure in-house tax investment as the total compensation of tax employees deflated by total assets, where the total compensation of tax employees is estimated based on the number of employees at different ranks and the prevailing salary for the respective ranks.<sup>19</sup> The inferences remain the same using this alternative proxy for in-house human capital tax investment.

## **6 Conclusion**

This study analyzes a major input in corporate tax planning: a firm's in-house human capital investment. Using hand-collected data on corporate tax employees for a sample of non-financial S&P1500 firms, we find that firms with larger in-house tax departments are associated with greater tax avoidance (i.e., they have lower cash and GAAP ETRs and higher book-tax differences), report lower uncertain tax benefits, have lower tax settlements, and exhibit less volatile tax rates. These findings suggest that firms with a larger number of in-house tax professionals are better able to lower their tax liability and reduce their tax risk. We also find that the proportion of senior tax professionals (managers and above) within the tax department and the tenure of tax professionals enhance the tax planning effectiveness of the tax department.

This study contributes to the accounting literature by being the first to look inside the "black box" of corporate tax departments. We document strong and robust evidence that a

---

<sup>19</sup> The information on the mean salary for tax professionals of different ranks is collected from salary.com.

larger in-house tax department is associated with more tax avoidance and lower tax risk. At the same time, we acknowledge that with data on tax employees covering only one year, our study is subject to some limitations. For example, we are unable to examine the relation between in-house tax department and tax planning over time. We believe that a firm's in-house tax investment is an important issue and leave this for future research when longer time-series data become available.

## REFERENCES

- Armstrong, C., J. Blouin, and D. Larcker. 2012. The Incentives for Tax Planning. *Journal of Accounting and Economics* 53: 391-411.
- Bauer, A. 2015. Tax Avoidance and the Implications of Weak Internal Controls. *Contemporary Accounting Research*, forthcoming.
- Bauer, A., and K. Klassen. 2014. Estimating Downside Tax Risk Using Large Unfavorable Tax Payments. Working paper, University of Illinois at Urbana-Champaign.
- Beck, P., and P. Lisowsky. 2014. Tax Uncertainty and Voluntary Real-Time Tax Audits. *The Accounting Review* 89: 867-901.
- Brown, J. 2011. The Spread of Aggressive Corporate Tax Reporting: A Detailed Examination of the Corporate-Owned Life Insurance Shelter. *The Accounting Review* 86: 23-57.
- Cameron, A., and P. Trivedi. 2005. *Microeconometrics: Methods and Applications*. Cambridge University Press.
- Chen, S., X. Chen, Q. Cheng, and T. Shevlin. 2010. Are Family Firms More Tax Aggressive than Non-family Firms? *Journal of Financial Economics* 95: 41-61.
- Chyz, J. 2015. Personally Tax Aggressive Executives and Corporate Tax Sheltering. *Journal of Accounting and Economics* 56: 311-328.
- Deloitte. 2006. What Do Companies Want from the Corporate Tax Function: CFO and Tax Executives' Perspectives on Corporate Tax. CFO Publishing Corp.
- De Simone, L., M. Ege, and B. Stromberg. 2015. Tax Internal Control Quality: The Role of Auditor-Provided Tax Services. *The Accounting Review* 90: 1469-1496.
- De Simone, L., L. Mills, and B. Stromberg. 2014. What Does Income Mobility Reveal About the Tax Risk-Reward Tradeoff? Working paper, Stanford University.
- Dell'Anna, F., and A. Staubli. 2008. Role of the Head of Tax. *International Tax Review* 2: 28-32.
- Dhaliwal, D., R. Gal-Or, V. Naiker, and D. Sharma. 2013. The Influence of the Audit Committee on Auditor Provided Tax Planning Services. Working paper, University of Arizona.
- Dichev, I., J. Graham, C. Harvey, and S. Rajgopal. 2013. Earnings Quality: Evidence from the Field. *Journal of Accounting and Economics* 56: 1-33.
- Donohoe, M., and G. McGill. 2011. The Effects of Increased Book-Tax Difference Tax Return Disclosures on Firm Valuation and Behavior. *Journal of the American Taxation Association* 33: 35-65.
- Donohoe, M., G. McGill, and E. Outslay. 2014. Risky Business: The Prosopography of Corporate Tax Planning. *National Tax Journal* 67: 851-874.
- Dunbar, A., and J. Phillips. 2001. The Outsourcing of Corporate Tax Function Activities. *Journal of the American Taxation Association* 23: 35-49.
- Dyreng, S., M. Hanlon, and E. Maydew. 2008. Long-run Corporate Tax Avoidance. *The Accounting Review* 83: 61-82.
- Dyreng, S., M. Hanlon, and E. Maydew. 2010. The Effects of Executives on Corporate Tax Avoidance. *The Accounting Review* 85: 1163-1189.
- Dyreng, S., M. Hanlon, E. Maydew, and J. Thornock. 2015. Changes in Corporate Effective Tax Rates Over the Past Twenty-Five Years. Working paper, Duke University.
- Dyreng, S., and B. Lindsey. 2009. Using Financial Accounting Data to Examine the Effect of Foreign Operations Located in Tax Havens and Other Countries on U.S. Multinational Firms' Tax Rates. *Journal of Accounting Research* 47: 1283-1316.

- Dyreng, S., B. Lindsey, and J. Thornock. 2013. Exploring the Role Delaware Plays as a Domestic Tax Haven. *Journal of Financial Economics* 108: 751-772.
- Ernst and Young. 2004. Tax Risk Management: The Evolving Role of Tax Directors. EYGM Limited.
- Fortune. 2011. GE's Taxes: A Case Study. < <http://fortune.com/2011/04/04/ges-taxes-a-case-study/>>.
- Frischmann, P., T. Shevlin, and R. Wilson. 2008. Economic Consequences of Increasing the Conformity in Accounting for Uncertain Tax Benefits. *Journal of Accounting and Economics* 46: 261-278.
- Gaertner, F. 2014. CEO After-tax Compensation Incentives and Corporate Tax Avoidance. *Contemporary Accounting Research* 31 (4): 1077-1102.
- Gallemore, J., and E. Labro. 2015. The Importance of the Internal Information Environment for Tax Avoidance. *Journal of Accounting and Economics* 60: 149-167.
- Gallemore, J., E. Maydew, and J. Thornock. 2014. The Reputational Costs of Tax Avoidance. *Contemporary Accounting Research* 31 (4): 1103-1133.
- Graham, J., M. Hanlon, T. Shevlin, and N. Shroff. 2014. Incentives for Tax Planning and Avoidance: Evidence from the Field. *The Accounting Review* 89: 991-1023.
- Graham, J., and A. Tucker. 2006. Tax Shelters and Corporate Debt Policy. *Journal of Financial Economics* 81: 563-594.
- Guenther, D., S. Matsunaga, and B. Williams. 2013. Tax Avoidance, Tax Aggressiveness, Tax Risk and Firm Risk. Working paper, University of Oregon.
- Hanlon, M., and S. Heitzman. 2010. A Review of Tax Research. *Journal of Accounting and Economics* 50: 127-178.
- Jiang, J., J. Robinson, and M. Wang. 2015. Sleeping with the Enemy: Taxes and Former IRS Employees. Working paper, Michigan State University.
- Klassen, K., and S. Laplante. 2012. Are U.S. Multinational Corporations Becoming More Aggressive Income Shifters? *Journal of Accounting Research* 50: 1245-1285.
- Klassen, K., P. Lisowsky, and D. Mescall. 2015. The Role of Auditors, Non-Auditors, and Internal Tax Departments in Corporate Tax Aggressiveness. *The Accounting Review*, forthcoming.
- Larcker, D., and T. Rusticus. 2010. On the Use of Instrumental Variables in Accounting Research. *Journal of Accounting and Economics* 49 (3): 186-205.
- Law, K., and L. Mills. 2015. CEO Characteristics and Corporate Taxes. Working paper, Tilburg University.
- Lennox, C., J. Francis, and Z. Wang. 2012. Selection Models in Accounting Research. *The Accounting Review* 87 (2): 589-616.
- Lisowsky, P. 2010. Seeking Shelter: Empirically Modeling Tax Shelters Using Financial Statement Information. *The Accounting Review* 85: 1693-1720.
- Lisowsky, P., L. Robinson, and A. Schmidt. 2013. Do Publicly Disclosed Tax Reserves Tell Us About Privately Disclosed Tax Shelter Activity? *Journal of Accounting Research* 51: 583-629.
- Lynch, D. 2014. Investing in the Corporate Tax Function: The Effects of Remediating Material Weaknesses in Internal Control on Tax Avoidance. Working paper, University of Wisconsin – Madison.
- Magro, A., and S. Nutter. 2012. Evaluating the Strength of Evidence: How Experience Affects the Use of Analogical Reasoning and Configural Information Processing in Tax. *The Accounting Review* 87: 291-312.

- Maydew, E., and D. Shackelford. 2007. The Changing Role of Auditors in Corporate Tax Planning. In: Auerbach, A., Hines, J., Slemrod, J., (Eds.) *Taxing Corporate Income in the 21<sup>st</sup> Century*. Cambridge University Press, New York.
- McGuire, S., S. Neuman, and T. Omer. 2013. Sustainable Tax Strategies and Earnings Persistence. Working paper, Texas A&M University.
- McGuire, S., T. Omer, and D. Wang. 2012. Tax Avoidance: Does Tax-Specific Industry Expertise Make a Difference? *The Accounting Review* 87: 975-1003.
- McKinnon, J. 2012. Firms Pass Up Tax Breaks, Citing Hassles, Complexity. *Wall Street Journal*. July 23, 2012.
- Mendola, M. 2014. Don't Neglect Your Tax Department. *CFO Magazine*.
- Mills, L. 1996. Corporate Tax Compliance and Financial Reporting. *National Tax Journal* 49: 421-435.
- Mills, L. 1998. Book-Tax Differences and Internal Revenue Service Adjustments. *Journal of Accounting Research* 36: 343-356.
- Mills, L., M. Erickson, and E. Maydew. 1998. Investments in Tax Planning. *Journal of the American Taxation Association* 20: 1-20.
- Mills, L., L. Robinson, and R. Sansing. 2010. FIN 48 and Tax Compliance. *The Accounting Review* 85: 1721-1742.
- Neuman, S., T. Omer, and A. Thomson. 2014. Determinants and Consequences of Tax Service Provider Choice in the Not-for-Profit Sector. *Contemporary Accounting Research* 32: 703-735.
- Powers, K., J. Robinson, and B. Stomberg. 2015. How Do Incentives Affect Corporate Tax Planning and Financial Reporting of Income Taxes? *Review of Accounting Studies*, forthcoming.
- Phillips, J. 2003. Corporate Tax-Planning Effectiveness: The Role of Compensation-Based Incentives. *The Accounting Review* 78: 847-874.
- Rego, S., and R. Wilson. 2012. Equity Risk Incentives and Corporate Tax Aggressiveness. *Journal of Accounting Research* 50: 775-810.
- Robinson, J., S. Sikes, and C. Weaver. 2010. Performance Measurement of Corporate Tax Departments. *The Accounting Review* 85: 1035-1064.
- Saavedra, D. 2015. Tax Spike Firms. Working paper, UCLA.
- Shackelford, D., and T. Shevlin. 2001. Empirical Tax Research in Accounting. *Journal of Accounting and Economics* 31: 321-387.
- Slemrod, J., and M. Blumenthal. 1996. The Income Tax Compliance Cost of Big Business. *Public Finance Quarterly* 24: 411-438.
- Slemrod, J., and V. Venkatesh. 2002. The Income Tax Compliance Cost of Large and Mid-Size Businesses. Report to the Internal Revenue Service Large and Mid-Size Business Division.
- Tax Executives Institute. 2012. *2011-2012 Corporate Tax Department Survey*. The Tax Executive Institute.
- U.S. House of Representatives. 2013. Interaction of Tax and Financial Accounting on Tax Reform. Committee on Ways and Means. February 8, 2012. Washington, D.C.: United States Government Printing Office.
- Wilson, R. 2009. An Examination of Corporate Tax Shelter Participants. *The Accounting Review* 84: 969-999.

## Appendix: Variable Definitions and Construction

Variable	Definitions, Construction, and Source
<i>INHOUSE_TAX</i>	The total number of in-house tax employees, divided by the total number of the firm's employees (in thousands). Source: <i>LinkedIn</i>
<i>TAX_EMPLOYEES</i>	The total number of in-house tax employees, including tax analysts, tax managers, and tax executives. Source: <i>LinkedIn</i>
<i>TAX_EXECUTIVES</i>	The number of tax executives, defined as those with job titles including "Tax Director," "VP Tax," "Chief Tax Counsel," "International Tax Counsel," etc. Source: <i>LinkedIn</i>
<i>TAX_MANAGERS</i>	The number of tax managers, defined as those with job titles including "Tax Manager," "Senior Tax Lawyer," "Tax Attorney," "Global Tax Accounting Manager," etc. Source: <i>LinkedIn</i>
<i>TAX_ANALYSTS</i>	The number of tax analysts, defined as those with job titles including "Tax Analyst," "Tax Specialist," "Corporate Tax Accountant," "Tax Associate," etc. Source: <i>LinkedIn</i>
<i>HIGH_SENIOR</i>	Indicator variable for tax departments with a high proportion of senior tax professionals, set as 1 if the tax department ranks in the top quartile based on the proportion of senior tax professionals (manager and above) in the tax department, and 0 otherwise. Source: <i>LinkedIn</i>
<i>HIGH_TENURE</i>	Indicator variable for tax departments that have tax professionals with a long average tenure, set as 1 if the tax department ranks in the top quartile based on the average tenure of tax professionals in the tax department, and 0 otherwise. Tenure is measured as the number of years the tax professional has worked for the current firm. Source: <i>LinkedIn</i>
<i>CashETR</i>	Cash effective tax rate over three years, calculated as the sum of a firm's cash tax paid over the three years divided by the sum of its total pre-tax book income, adjusted for special items, over the same period (Dyreg et al. 2008). Observations with a negative denominator (pre-tax income adjusted for special items) are discarded. Source: Compustat
<i>UTB</i>	Uncertain tax benefits, calculated as the three-year average of the ending balance of uncertain tax benefits divided by the average beginning total assets over the same period. We multiple <i>UTB</i> by 100 to make it easier to interpret the regression coefficient. Source: Compustat
<i>ETR</i>	GAAP effective tax rate over three years, calculated as the sum of a firm's income tax expense over the three years divided by the sum of its total pre-tax book income over the same period. Observations with a negative denominator (pre-tax income) are discarded. Source: Compustat

<i>BTD</i>	Book-to-tax difference over three years, calculated as the difference between the sum of a firm's pre-tax book income over the three years and the sum of its estimated taxable income over the three years, divided by the average beginning total assets over the same period. Source: Compustat
<i>SETTLE</i>	Tax settlement, calculated as the three-year average of the tax settlement divided by the average beginning total assets over the same period. We multiple <i>SETTLE</i> by 100 to make it easier to interpret the regression coefficient. Source: Compustat
<i>SD_CashETR</i>	Standard deviation of annual <i>Cash ETR</i> over three years. Source: Compustat
<i>SD_ETR</i>	Standard deviation of annual GAAP <i>ETR</i> over three years. Source: Compustat
<i>SD_PTBI</i>	Standard deviation of pre-tax book income (deflated by total assets) over three years. Source: Compustat
<i>SIZE</i>	Total assets. We use the natural logarithm of total assets in the regressions. Source: Compustat
<i>ROA</i>	Pre-tax income divided by lagged assets. Source: Compustat
<i>MTB</i>	Market value of equity divided by book value of common equity. Source: Compustat
<i>LEV</i>	Leverage, calculated as total long-term debt divided by lagged assets. Source: Compustat
<i>PPE</i>	Capital intensity, calculated as net property, plant, and equipment divided by lagged assets. Source: Compustat
<i>R&amp;D</i>	Research and development expenditure divided by lagged assets. Source: Compustat
<i>INTANG</i>	Intangible assets divided by lagged assets. Source: Compustat
<i>FI</i>	Foreign income divided by lagged assets. Source: Compustat
<i>FOREIGN</i>	Indicator variable for positive foreign income, set as 1 if foreign income is positive and 0 otherwise. Source: Compustat
<i>NOL</i>	Indicator variable for loss carry forward, set as 1 if the loss carried forward is nonzero at the beginning of the year and 0 otherwise. Source: Compustat

<i>TAX_FEES</i>	Tax fees paid to the auditor. We use the natural logarithm of one plus tax fees in the regressions. Source: Audit Analytics
<i>ICW</i>	Indicator variable for the presence of 404 material weaknesses, set as 1 if the firm reports a 404 or a 302 material weakness in internal control during the current fiscal year and 0 otherwise. Source: Audit Analytics
<i>TAX_EDUCATION</i>	The number of graduate tax programs (e.g., LLM in Tax and MS in Tax) offered by universities in the state of the firm's headquarter. Source: Various online sources including U.S. News Education, TaxTalent, TaxProf Blog, and universities' websites.

---

**Table 1 Characteristics of Tax Employees**

This table reports the mean educational background and work experience of the 6,267 corporate tax professionals in the sample firms' tax departments, based on the employees' self-reported profiles on *LinkedIn*. The sample firms include 1,021 non-financial S&P1500 firms in 2014. The rank of the tax employees is determined based on job titles. Note that overall education sums to more than one across different categories because the categories are not mutually exclusive. For example, some tax employees may have more than one graduate degree (e.g., tax and law). Previous work experience sums to less than one across the categories (*IRS*, *CORP\_TAX\_SENIOR*, and *BIGN*) because we only count these specific types of experiences.

	Total N=6,267	<i>SENIOR_TAX</i> =1 N=3,411	<i>SENIOR_TAX</i> =0 N=2,856	<i>p</i> -value of difference
<b><i>Undergraduate Education</i></b>				
<i>ACCT</i>	0.55	0.52	0.59	0.00
<b><i>Graduate Education</i></b>				
<i>MTAX</i>	0.27	0.37	0.15	0.00
<i>LAW</i>	0.11	0.18	0.03	0.00
<i>OTHER_MASTER</i>	0.31	0.32	0.30	0.11
<b><i>Professional Designation</i></b>				
<i>CPA</i>	0.22	0.23	0.21	0.08
<b><i>Previous Work Experience</i></b>				
<i>IRS</i>	0.01	0.02	0.01	0.01
<i>CORP_TAX_SENIOR</i>	0.18	0.28	0.06	0.00
<i>BIGN</i>	0.36	0.48	0.22	0.00
<b><i>Highest Title in BIGN</i></b>				
<i>BIGN_TAX_PARTNER</i>	0.01	0.02	0.00	0.00
<i>BIGN_TAX_SENIOR</i>	0.14	0.23	0.04	0.00

The variables are defined as follows:

<i>SENIOR_TAX</i>	Indicator for a senior tax professional (tax executive or manager).
<i>ACCT</i>	Indicator for an undergraduate degree in accounting.
<i>MTAX</i>	Indicator for a graduate degree in taxation.
<i>LAW</i>	Indicator for a graduate degree in law.
<i>OTHER_MASTER</i>	Indicator for a graduate degree in business (other than taxation and law).
<i>CPA</i>	Indicator for a CPA or equivalent (such as CA).
<i>IRS</i>	Indicator for an employee who has previously been employed at the IRS.
<i>CORP_TAX_SENIOR</i>	Indicator for an employee who has previously been employed at a corporate tax department at the manager level or above.
<i>BIGN</i>	Indicator for an employee who has previously been employed at a Big N audit firm.
<i>BIGN_TAX_PARTNER</i>	Indicator for an employee who has previously been employed at a Big N audit firm as a tax partner.
<i>BIGN_TAX_SENIOR</i>	Indicator for an employee who has previously been employed at a Big N audit firm as a tax manager.

**Table 2 Descriptive Statistics of the Firm-Level Characteristics**

This table presents the descriptive statistics for the measures of in-house human capital investment in tax planning, the proxies for tax avoidance and tax risk, and firm characteristics. The full sample includes 1,021 firms with available data.

	<b>Mean</b>	<b>S.D.</b>	<b>Q1</b>	<b>Median</b>	<b>Q3</b>
<b><i>Measures of In-House Human Capital Investment in Tax Planning</i></b>					
<i>TAX_EMPLOYEES</i>	6.138	10.444	1.000	3.000	8.000
<i>TAX_EXECUTIVES</i>	1.440	3.002	0.000	1.000	2.000
<i>TAX_MANAGERS</i>	1.901	4.241	0.000	1.000	2.000
<i>TAX_ANALYSTS</i>	2.797	4.708	0.000	1.000	3.000
<i>INHOUSE_TAX</i>	0.696	1.008	0.121	0.370	0.836
<b><i>Proxies for Tax Avoidance</i></b>					
<i>CashETR</i>	0.251	0.159	0.153	0.252	0.332
<i>ETR</i>	0.305	0.146	0.245	0.316	0.364
<i>BTD</i>	0.016	0.040	-0.005	0.013	0.034
<b><i>Proxies for Tax Risk</i></b>					
<i>UTB(% of assets)</i>	0.853	1.104	0.103	0.482	1.182
<i>SETTLE(% of assets)</i>	0.065	0.153	0.000	0.010	0.062
<i>SD_CashETR</i>	0.080	0.087	0.026	0.054	0.099
<i>SD_ETR</i>	0.067	0.098	0.011	0.028	0.080
<b><i>Firm Characteristics</i></b>					
<i>SIZE (in millions)</i>	11,792	24,116	1,167	3,319	9,655
<i>ROA</i>	0.101	0.084	0.049	0.086	0.139
<i>MTB</i>	3.833	4.032	1.783	2.783	4.426
<i>LEV</i>	0.236	0.197	0.094	0.214	0.334
<i>PPE</i>	0.296	0.265	0.093	0.199	0.420
<i>R&amp;D</i>	0.027	0.046	0.000	0.000	0.033
<i>INTANG</i>	0.260	0.243	0.051	0.204	0.399
<i>FI</i>	0.028	0.040	0.000	0.012	0.045
<i>FOREIGN</i>	0.620	0.486	0.000	1.000	1.000
<i>NOL</i>	0.433	0.496	0.000	0.000	1.000
<i>TAX_FEES (in millions)</i>	0.579	1.105	0.024	0.165	0.575
<i>ICW</i>	0.045	0.208	0.000	0.000	0.000
<b><i>Number of Graduate Tax Programs</i></b>					
<i>TAX_EDUCATION</i>	7.885	7.345	2.000	8.000	12.000

**Table 3 Correlations**

This table reports the Pearson correlations between the variables used in the main analysis. The correlations in bold are significant at the 0.10 level (based on two-tailed tests). The variable definitions are provided in the Appendix. The full sample includes 1,021 firms with available data.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) <i>INHOUSE_TAX</i>															
(2) <i>CashETR</i>	<b>-0.159</b>														
(3) <i>UTB</i>	<b>0.054</b>	<b>-0.059</b>													
(4) <i>SIZE</i>	<b>-0.052</b>	<b>-0.179</b>	<b>0.115</b>												
(5) <i>ROA</i>	<b>-0.117</b>	<b>0.167</b>	<b>0.057</b>	<b>-0.078</b>											
(6) <i>MTB</i>	-0.040	<b>0.085</b>	<b>0.080</b>	0.019	<b>0.276</b>										
(7) <i>LEV</i>	<b>0.064</b>	<b>-0.178</b>	<b>-0.074</b>	<b>0.297</b>	<b>-0.155</b>	<b>0.055</b>									
(8) <i>PPE</i>	<b>0.071</b>	<b>-0.242</b>	<b>-0.311</b>	<b>0.202</b>	<b>-0.068</b>	<b>-0.107</b>	<b>0.231</b>								
(9) <i>R&amp;D</i>	<b>0.089</b>	<b>-0.113</b>	<b>0.361</b>	<b>-0.174</b>	0.042	<b>0.123</b>	<b>-0.197</b>	<b>-0.310</b>							
(10) <i>INTANG</i>	0.009	<b>0.082</b>	<b>0.109</b>	<b>0.064</b>	<b>-0.085</b>	<b>0.054</b>	<b>0.317</b>	<b>-0.439</b>	<b>0.116</b>						
(11) <i>FI</i>	-0.020	-0.049	<b>0.351</b>	<b>0.107</b>	<b>0.268</b>	<b>0.164</b>	<b>-0.089</b>	<b>-0.266</b>	<b>0.270</b>	0.042					
(12) <i>FOREIGN</i>	-0.010	<b>0.102</b>	<b>0.273</b>	<b>0.082</b>	<b>0.064</b>	<b>0.072</b>	<b>-0.091</b>	<b>-0.413</b>	<b>0.217</b>	<b>0.191</b>	<b>0.579</b>				
(13) <i>NOL</i>	-0.039	<b>0.094</b>	<b>0.104</b>	<b>-0.133</b>	0.032	0.003	-0.008	<b>-0.187</b>	<b>0.075</b>	<b>0.125</b>	<b>0.089</b>	<b>0.139</b>			
(14) <i>TAX_FEES</i>	-0.033	0.014	<b>0.167</b>	<b>0.308</b>	-0.027	<b>0.096</b>	0.030	<b>-0.170</b>	0.041	<b>0.155</b>	<b>0.165</b>	<b>0.224</b>	0.040		
(15) <i>ICW</i>	0.004	<b>0.095</b>	0.021	<b>-0.128</b>	<b>-0.084</b>	0.000	-0.047	-0.036	<b>0.064</b>	-0.024	-0.049	-0.015	0.017	<b>0.052</b>	
(16) <i>TAX_EDUCATION</i>	<b>0.089</b>	-0.030	<b>0.240</b>	-0.031	-0.019	-0.017	<b>-0.111</b>	<b>-0.188</b>	<b>0.300</b>	0.013	<b>0.149</b>	<b>0.141</b>	<b>0.059</b>	0.042	0.043

**Table 4 Association between In-house Human Capital Investment in Tax Planning and Tax Avoidance: Test of H1**

This table reports the regression results of *CashETR* on *INHOUSE\_TAX*, using the IV approach. The full sample includes 1,021 firms with available data. The variable definitions are provided in the Appendix. The t-statistics are in parentheses and are based on heteroskedasticity-consistent standard errors. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) <i>INHOUSE_TAX</i>	(2) <i>CashETR</i>
<i>INHOUSE_TAX</i>		-0.023*** (-5.684)
<i>SIZE</i>	-0.063*** (-3.168)	-0.007*** (-2.620)
<i>ROA</i>	-0.601* (-1.936)	0.179*** (3.763)
<i>MTB</i>	-0.001 (-0.898)	0.001 (0.861)
<i>LEV</i>	0.368** (2.085)	-0.072*** (-3.212)
<i>PPE</i>	0.042 (0.283)	-0.071*** (-3.212)
<i>R&amp;D</i>	1.254* (1.925)	-0.434*** (-5.336)
<i>INTANG</i>	0.159 (1.113)	0.036* (1.784)
<i>FI</i>	-0.148 (-0.256)	-0.463*** (-4.836)
<i>FOREIGN</i>	0.091 (1.230)	0.035*** (3.408)
<i>NOL</i>	-0.079 (-1.358)	0.006 (0.813)
<i>TAX_FEES</i>	-0.002 (-0.335)	-0.000 (-0.224)
<i>ICW</i>	-0.078 (-0.567)	0.033 (1.611)
<i>TAX_EDUCATION</i>	0.022*** (3.036)	
Industry FEs	Yes	Yes
N	1,021	1,021
Adj. R <sup>2</sup>	0.091	0.207
Partial F-statistic ( <i>Tax_Education</i> ) (Weak identification test)	9.21***	

**Table 5 Association between In-house Human Capital Investment in Tax Planning and Tax Risk: Test of H2**

This table reports the regression results of *UTB* on *INHOUSE\_TAX*, using the IV approach. The full sample includes 927 firms with available data; the sample is smaller than that in Table 4 due to the availability of *UTB* data. The variable definitions are provided in the Appendix. The t-statistics are in parentheses and are based on heteroskedasticity-consistent standard errors. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) <i>INHOUSE_TAX</i>	(2) <i>UTB</i>
<i>INHOUSE_TAX</i>		-0.099** (-2.140)
<i>SIZE</i>	-0.064*** (-3.108)	0.001*** (5.954)
<i>ROA</i>	-0.602* (-1.932)	0.003 (0.953)
<i>MTB</i>	-0.000 (-0.885)	0.000 (0.205)
<i>LEV</i>	0.352** (2.059)	0.001 (0.515)
<i>PPE</i>	0.037 (0.238)	-0.006*** (-5.646)
<i>R&amp;D</i>	1.297* (1.954)	0.075*** (8.141)
<i>INTANG</i>	0.160 (1.112)	-0.002* (-1.654)
<i>FI</i>	-0.212 (-0.254)	0.030*** (3.306)
<i>FOREIGN</i>	0.096 (1.246)	0.002** (2.370)
<i>NOL</i>	-0.083 (-1.371)	0.000 (0.524)
<i>TAX_FEES</i>	-0.002 (-0.359)	0.000 (1.536)
<i>ICW</i>	-0.071 (-0.523)	0.002 (1.495)
<i>TAX_EDUCATION</i>	0.023*** (2.995)	
Industry FEs	Yes	Yes
N	927	927
Adj. R <sup>2</sup>	0.091	0.246
Partial F-statistic( <i>Tax_Education</i> ) (Weak identification test)	8.97***	

**Table 6 Association between In-house Human Capital Investment in Tax Planning and Tax Avoidance and Tax Risk**  
**- Alternative Proxies for Tax Avoidance and Tax Risk**

This table reports the second-stage IV regression results using alternative proxies, including *ETR* and *BTD* for tax avoidance and *SETTLE*, *SD\_CashETR*, and *SD\_ETR* for tax risk. The full sample includes 1,021 firms with available data and the sample used in some regressions is smaller due to additional data requirements. The variable definitions are provided in the Appendix. The t-statistics are in parentheses and are based on heteroskedasticity-consistent standard errors. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

*Panel A: Alternative Proxies for Tax Avoidance*

	(1) <i>ETR</i>	(2) <i>BTD</i>
<i>INHOUSE_TAX</i>	-0.017** (-2.450)	0.006** (2.089)
<i>SIZE</i>	-0.012*** (-4.065)	0.002*** (2.911)
<i>ROA</i>	-0.023 (-0.398)	0.029* (1.763)
<i>MTB</i>	0.001 (1.074)	-0.001*** (-2.629)
<i>LEV</i>	0.055** (2.203)	0.019** (2.464)
<i>PPE</i>	-0.027 (-1.182)	0.018*** (3.676)
<i>R&amp;D</i>	-0.459*** (-3.761)	0.091*** (2.928)
<i>INTANG</i>	-0.027 (-1.311)	-0.005 (-1.048)
<i>FI</i>	-0.498*** (-4.681)	0.478*** (11.054)
<i>FOREIGN</i>	0.006 (0.533)	-0.010*** (-3.626)
<i>NOL</i>	-0.004 (-0.534)	-0.001 (-0.561)
<i>TAX_FEES</i>	-0.000 (-0.514)	-0.000 (-1.134)
<i>ICW</i>	0.017 (0.855)	-0.012** (-1.987)
Industry FEs	Yes	Yes
N	1,009	985
Adj. R <sup>2</sup>	0.202	0.207

**Table 6 (Cont'd)**

*Panel B: Alternative Proxies for Tax Risk*

	(1)	(2)	(3)
	<i>SETTLE</i>	<i>SD_CashETR</i>	<i>SD_ETR</i>
<i>INHOUSE_TAX</i>	-0.025*** (-3.644)	-0.011*** (-6.161)	-0.012** (-2.434)
<i>SIZE</i>	0.000*** (4.291)	-0.014*** (-6.824)	-0.007*** (-2.699)
<i>ROA</i>	-0.001* (-1.693)	-0.213*** (-7.167)	-0.353*** (-10.571)
<i>MTB</i>	0.000 (0.472)	-0.000 (-0.081)	0.000 (0.237)
<i>LEV</i>	0.000 (0.364)	-0.010 (-0.789)	0.034** (2.084)
<i>PPE</i>	-0.001*** (-3.741)	0.027* (1.844)	-0.034** (-2.189)
<i>R&amp;D</i>	0.006*** (4.268)	0.178*** (2.717)	0.176** (2.055)
<i>INTANG</i>	-0.001*** (-3.669)	0.011 (0.898)	-0.031* (-1.820)
<i>FI</i>	0.009*** (5.360)	-0.208*** (-3.115)	-0.085 (-1.225)
<i>FOREIGN</i>	-0.000** (-2.149)	0.012* (1.879)	-0.005 (-0.627)
<i>NOL</i>	-0.000 (-0.297)	-0.004 (-0.736)	0.010* (1.932)
<i>TAX_FEES</i>	0.000 (0.762)	-0.001 (-0.957)	-0.001* (-1.701)
<i>ICW</i>	-0.000 (-1.160)	0.017 (1.192)	0.015 (1.418)
<i>SD_PTBI</i>		12.13*** (4.225)	10.58*** (4.300)
Industry FEs	Yes	Yes	Yes
N	906	1,016	1,009
Adj. R <sup>2</sup>	0.050	0.101	0.138

**Table 7 Cross-sectional Analyses:  
Seniority of Tax Professionals in the Tax Department**

This table reports the results of the cross-sectional analyses of the association between *INHOUSE\_TAX* and tax avoidance and risk, using OLS estimations. *HIGH\_SENIOR* equals one if the tax department ranks in the top quartile based on the proportion of senior tax professionals (manager and above) in the tax department, and zero otherwise. *LOW\_SENIOR* is defined as one minus *HIGH\_SENIOR*. The full sample includes 1,021 firms with available data and the sample used in column (2) is smaller due to the availability of *UTB* data. The variable definitions are provided in the Appendix. The t-statistics are in parentheses and are based on heteroskedasticity-consistent standard errors. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	<i>CashETR</i>	<i>UTB</i>
<i>INHOUSE_TAX</i> × <i>HIGH_SENIOR</i> (a)	-0.067*** (-2.844)	-0.003*** (-2.670)
<i>INHOUSE_TAX</i> × <i>LOW_SENIOR</i> (b)	-0.003 (-0.315)	0.001 (1.072)
<i>SIZE</i>	-0.010** (-2.103)	0.001*** (4.748)
<i>ROA</i>	-0.422*** (-4.217)	-0.012** (-2.170)
<i>MTB</i>	0.001 (1.166)	0.000 (1.192)
<i>LEV</i>	-0.053 (-1.392)	-0.000 (-0.078)
<i>PPE</i>	-0.067 (-1.574)	-0.007*** (-3.953)
<i>R&amp;D</i>	-0.256 (-1.305)	0.078*** (5.210)
<i>INTANG</i>	0.032 (0.826)	-0.005** (-2.085)
<i>FI</i>	-0.116 (-0.680)	0.041*** (2.861)
<i>FOREIGN</i>	0.003 (0.147)	-0.001 (-1.143)
<i>NOL</i>	-0.016 (-1.159)	-0.000 (-0.064)
<i>TAX_FEES</i>	-0.001 (-0.835)	0.000 (0.121)
<i>ICW</i>	0.070 (1.583)	0.001 (0.659)
<i>HIGH_SENIOR</i>	-0.013 (-0.677)	-0.002 (-1.384)
Industry FEs	Yes	Yes
N	1,021	927
Adj. R <sup>2</sup>	0.170	0.224
Incremental effect of seniority:		
(a) – (b)	-0.064** (-2.609)	-0.004*** (-2.953)

**Table 8 Cross-sectional Analyses:  
Tenure of Tax Professionals in the Tax Department**

This table reports the results of the cross-sectional analyses of the association between *INHOUSE\_TAX* and tax avoidance and risk, using OLS estimations. *HIGH\_TENURE* equals one if the tax department ranks in the top quartile based on the average tenure of tax professionals in the tax department, and zero otherwise. Tenure is measured as the number of years the tax professional has worked for the current firm. *LOW\_TENURE* is defined as one minus *HIGH\_TENURE*. The full sample includes 1,021 firms with available data and the sample used in column (2) is smaller due to the availability of *UTB* data. Variable definitions are provided in the Appendix. The t-statistics are in parentheses and are based on heteroskedasticity-consistent standard errors. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) <i>CashETR</i>	(2) <i>UTB</i>
<i>INHOUSE_TAX</i> × <i>HIGH_TENURE</i> (a)	-0.019** (-2.385)	-0.001** (-2.100)
<i>INHOUSE_TAX</i> × <i>LOW_TENURE</i> (b)	-0.006 (-1.151)	0.001** (2.453)
<i>SIZE</i>	-0.006* (-1.900)	0.002*** (5.883)
<i>ROA</i>	0.086 (1.557)	-0.004 (-0.805)
<i>MTB</i>	0.001 (1.069)	0.000 (1.397)
<i>LEV</i>	-0.090*** (-4.371)	-0.000 (-0.066)
<i>PPE</i>	-0.062*** (-2.596)	-0.008*** (-3.776)
<i>R&amp;D</i>	-0.402*** (-3.015)	0.084*** (4.507)
<i>INTANG</i>	-0.019 (-0.862)	-0.003 (-1.458)
<i>FI</i>	-0.323*** (-2.664)	0.034** (2.299)
<i>FOREIGN</i>	0.028** (2.563)	-0.001 (-1.268)
<i>NOL</i>	-0.017** (-2.268)	0.001 (0.993)
<i>TAX_FEES</i>	0.001 (0.724)	0.000 (0.313)
<i>ICW</i>	0.019 (0.975)	0.003 (1.076)
<i>HIGH_TENURE</i>	0.004 (0.396)	0.002* (1.807)
Industry FEs	Yes	Yes
N	1,021	927
Adj. R <sup>2</sup>	0.248	0.263
Incremental effect of tenure:		
(a) – (b)	-0.014 (-1.484)	-0.002*** (-3.342)