Corporate In-house Tax Departments*

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ABSTRACT

In-house human capital tax investment is a significant input to a firm's tax decisions. Yet, due to the lack of data on corporate in-house tax departments, there is little empirical evidence on how tax departments are associated with tax planning and compliance outcomes. We expect the size of tax departments to be positively associated with the effectiveness of tax planning and compliance. Using hand-collected data on the number of corporate tax employees in S&P1500 firms over the 2009-2014 period, we find that firms with larger tax departments are associated with lower and less volatile cash effective tax rates. Furthermore, using tax employees' specialization, we identify tax departments' relative focus on planning or compliance and document a trade-off between tax avoidance and tax risk. Specifically, tax departments with more of a tax planning focus have incrementally greater tax avoidance but higher tax risk, whereas tax departments with more of a tax compliance focus have incrementally lower tax risk but higher tax rates. Overall, this paper contributes to the literature by looking inside the "black box" of corporate tax departments and shedding light on the importance of human capital tax investment for tax outcomes.

Keywords: tax department, tax planning, tax compliance, tax avoidance, tax risk

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1. Introduction

In this study, we investigate how a firm's in-house tax department—a direct input to corporate tax decisions—affects tax planning and compliance outcomes. Building an in-house tax department is important for firms to achieve tax-related objectives. According to survey data, internal tax personnel expenditures account for the majority of corporate tax-related investments.[1] However, despite the significance of internal tax investments, there is limited research on how such investments affect tax planning and compliance outcomes (Dyreng and Maydew 2018), mainly due to the lack of data on in-house tax departments. We circumvent this problem by compiling a novel dataset of corporate tax employees from LinkedIn for S&P 1500 firms over the 2009-2014 period.

In-house tax departments' primary roles encompass tax planning and tax compliance. Following prior research, we define tax planning as activities with the objective of reducing the amount of taxes paid (e.g., Dyreng et al. 2008), and tax compliance as activities related to fulfilling the requirements of tax laws and reducing tax risk (e.g., Mills 1996). The job descriptions of tax employees whose job titles include "planning" or "compliance" in LinkedIn substantiate these definitions. We find that tax planning employees' job descriptions mostly include activities related to various tax planning mechanisms such as corporate structure and reorganization, transfer pricing, and foreign earnings repatriation, while tax compliance employees' job descriptions mostly include activities such as tax return filings, tax return audits, and tax related internal control.

[1] For example, based on a survey by the Office of Tax Policy Research, Slemrod and Venkatesh (2002) report that 58.7% of total tax-related expenditures are internal personnel expenditures (such as salary and fringe benefits), 16.5% are internal non-personnel expenditures (such as software, record keeping, and travel), and 24.8% are external tax services. In terms of economic magnitude, Slemrod and Blumenthal (1996) estimate that the total annual tax-related investments for 1,300 large corporations is $2.08 billion, or $1.57 million per firm.

Our first set of predictions are related to the effect of the overall in-house tax investments on tax avoidance and tax risk, which are used empirically to capture the outcome of tax planning and tax compliance, respectively. As firms invest more in in-house tax departments, they can devote more personnel to tax planning and tax compliance and will be better able to implement tax planning strategies and manage tax risk, leading to greater tax avoidance and lower tax risk. Our arguments are consistent with the opinion of the several tax experts we interviewed.[2] For example, the interviewees commented that tax planning and compliance are "very much driven by the in-house tax team" (4), and "if you have a lot of very experienced people in tax function, they want to be seen as doing high value-added work" (2).

To test our first set of predictions, we use the size of a firm's in-house tax department to proxy for its overall in-house tax investment.[3] Following prior studies (e.g., Dyreng et al. 2008; Guenther et al. 2017; McGuire et al. 2013), we use the level and volatility of cash effective tax rate (ETR) as our proxies for tax avoidance and tax risk, respectively. Because the size of in-house tax departments is likely endogenously determined, we use an instrumental variable (IV) – the number of tax graduate programs in 2004 in the state of the firm's headquarters. The number of tax programs affects the supply of tax professionals in the state, satisfying the relevance criteria of IV. At the same time, it is unlikely that the number of tax programs in 2004 is affected by individual firms' tax outcomes five to ten years later, satisfying the exclusion criteria of IV. We then use the control function approach to address the potential endogeneity. Specifically, we

[2] To provide institutional evidence, we have interviewed four tax experts (including tax partners at accounting firms and former corporate tax executives). The assigned interviewee numbers are included in parentheses ((1), (2), (3), or (4)) after direct quotations. Please see Section 2 for details of the interviews. We discuss the insights from the interviews where relevant. We received IRB approval for the interviews (SMU-IRB Reference Number: IRB-19-089-E031(919)).

[3] We measure the size of a firm's in-house tax department as the total number of tax employees deflated by the firm's total number of employees (in thousands). In sensitivity tests, we use alternative measures, including the logarithm of the total number of tax employees and the estimated total salary of tax employees deflated by total assets. We obtain the same inferences.

estimate a prediction model for the size of in-house tax departments using the IV and control variables and include the residuals from the prediction model in the regressions explaining tax outcomes.

Consistent with the predictions, we find that firms with larger in-house tax departments are associated with lower and less volatile cash ETR. In terms of economic significance, an increase from the first to the third quartile of in-house tax department size is associated with a reduction in cash ETR of 0.8 percentage points (a relative decrease of 3.3%) and a reduction in the standard deviation of cash ETR of 1.7 percentage points (a relative decrease of 17%).

Our next set of predictions are related to how tax departments' resource allocation between planning and compliance incrementally affects tax avoidance and tax risk. While tax departments engage in both planning and compliance, firms can differ in their tax department's focus and relative resource allocation between the two areas. We use "planning" or "compliance" in the most senior tax executive's job title in LinkedIn to identify tax departments that focus relatively more on tax planning or compliance. Among the sample firms with tax departments, 11% are classified as having a tax planning focus and 9% are classified as having a tax compliance focus.[4] We find that, as expected, after controlling for tax department size and other factors, tax departments with a planning focus are associated with incrementally more tax avoidance and tax departments with a compliance focus are associated with incrementally lower tax risk.

We also find evidence suggesting a trade-off between tax planning and tax compliance. Specifically, firms whose tax departments have a tax planning focus have higher tax risk and firms whose tax departments have a tax compliance focus have higher tax rates. We explore what might affect tax departments' focus and find that tax departments' focus on tax planning or

[4] We obtain the same inferences when we classify tax departments' focus based on the proportion of tax employees with "planning" or "compliance" in their job titles. See Section 3 for details.

compliance is systematically related to factors such as firms' operation complexity, reputation concerns, managerial ownership, the desire to reduce tax expenses, and the desire to reduce tax risk.

We conduct two additional analyses to provide more insights. First, we find that tax employees' prior work experience matters for the effectiveness of tax planning and compliance. Compared with other tax employees, those with prior work experience in public accounting (law) firms have a greater impact on the effectiveness of tax planning (compliance). Second, we find that the effect of in-house tax investments on tax avoidance and tax risk is less for firms that also pay tax fees to their auditors. This suggests that in-house tax investments and auditor-provided tax services are substitutes, which is consistent with the observation shared by one interviewee, "there are some tax directors who see [tax service providers] as competitors" (3).

Our results are robust to a series of sensitivity tests. First, we obtain the same inferences using the change specification where we regress the change in the level and volatility of cash effective tax on the lagged change in tax department size and controls. We also find that while adding tax professionals improves the effectiveness of tax planning and compliance, reducing the number of tax professionals does not appear to adversely affect tax planning and compliance in the short-term. Second, our results hold for alternative measures of tax investments, tax avoidance, and tax risk. Third, we document a non-linear effect of in-house tax department size on tax avoidance; cash ETR decreases with tax department size at a decreasing rate. Lastly, we conduct a falsification test by examining the effect of accounting department size (excluding tax employees) on tax outcomes. We find that accounting department size does not significantly affect tax outcomes, except for small firms, whose accounting employees likely handle tax-related tasks due to a lack of dedicated tax employees.

This study contributes to the literature in several important ways. First, our study looks inside the "black box" of in-house tax departments. Despite the importance of internal tax investments, empirical evidence on their effect is sparse. We hand-collect detailed data on tax employees from LinkedIn and conduct comprehensive analyses of the effect of in-house tax departments on both tax avoidance and tax risk, filling a gap in the literature. Mills et al. (1998) examine tax investments using survey data from 365 firms in 1992. They document a negative association between *total* tax investments (including internal and external tax investments) and GAAP ETR, but they *do not* find a significant association between internal tax investments and GAAP ETR, possibly due to the small sample size. We extend Mills et al. by examining a much larger sample (S&P 1500 firms) over a longer and more recent period (2009-2014) and providing robust evidence that internal tax investments lead to more effective tax planning *and* tax compliance.

Second, we take advantage of the richness of LinkedIn data to shed light on internal tax departments' structure and tax employees' educational background, work experience, and career path, and to conduct contextual analyses related to tax departments' focus. Our paper is related to, but different from, Jiang et al. (2020), who use LinkedIn to identify corporate tax employees with IRS experience and find that those employees are more effective in lowering firms' tax rates. Unlike Jiang et al. (2020), we focus on the entire tax department, whereas tax employees with IRS experience are only a small portion (2%) of our sample of tax employees. We obtain the same inferences after excluding tax employees with IRS experience.

Third, our study adds to the evidence on the interplay between tax avoidance and tax risk. As pointed out by Wilde and Wilson (2018), a question that is not well-understood is whether tax risk increases with tax planning. Our evidence suggests that, on average, larger tax departments

are associated with greater tax avoidance *and* lower tax risk, suggesting that firms allocate resources to implement tax planning strategies and manage tax risk at the same time (Guenther et al. 2017). However, we also document a trade-off between tax avoidance and tax risk for the subset of firms that choose to focus more on tax planning or tax compliance. Holding the tax department size constant, a greater focus on tax planning reduces tax rates but leads to higher tax risk, and vice versa. Our findings are consistent with the observations of the interviewees. They shared that both tax planning and compliance are important activities and also commented that some firms are in an "offensive mode" (4), always looking for tax planning opportunities, and others are in a "defensive mode" (4), making sure that "everything is in compliance" (4).

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

2. Hypothesis Development

Both tax planning and tax compliance are important to firms. While saving taxes (tax avoidance) is beneficial to firms, tax compliance activities, which allow firms to reduce tax risk and maintain a stable tax rate over time, are also important. Recent studies suggest that the volatility of tax rates is detrimental to firms. For example, the volatility of cash ETR is positively associated with both the likelihood of unfavorable tax settlement and the volatility of stock returns, and negatively associated with earnings persistence (Bauer and Klassen 2017; Guenther et al. 2017; McGuire et al. 2013). According to a survey by the Tax Executives Institute (TEI) of 500 chief tax officers around the world, the top measures that are used to evaluate a corporate tax department's performance are related to tax compliance and planning – "lack of surprises"

(72%), "the results of audits" (60%), "meeting compliance deadlines" (59%), "cash taxes" (57%), and "effective tax rates" (53%) (TEI 2012, p. 23).

A well-staffed in-house tax department can facilitate a firm's tax planning through channels such as the identification of tax saving opportunities, coordination and information sharing with other units of the firm, effective internal control, and in-depth knowledge to transform opportunities into actual tax savings.[5] At the same time, a well-staffed tax department can devote more resources to tax compliance work such as research, examination, and documentation to fulfill the tax law requirements. As a result, firms will possess stronger supporting facts regarding their tax positions and will be better able to sustain the tax positions over time, reducing tax risk.

To better understand the role of in-house tax departments in tax decisions, we interviewed four tax experts who have extensive experience with corporate tax planning and compliance issues.[6] The interviewees commented that both tax planning and compliance are important activities – in-house tax departments are "quite active in tax planning" (2) and "are always constantly looking at the structure, operating model, and see how to plan" (2), and "definitely tax

[5] For example, Xilinx Inc., the winner of "America's Best In-house Tax Team" award in 2010 (awarded by *International Tax Review*), saved more than $40 million in taxes through transfer pricing by not allocating employee stock option expenses to its Irish subsidiary. The IRS challenged Xilinx's decisions but the tax disputes were resolved in Xilinx's favor. As another example, a retired senior tax counsel shared the following anecdote with us: "In the early 1990s, GE Lighting was the largest lighting company in the world, with approximately $4 billion in sales. There was no in-house professional at Nela Park, Ohio, at the HQ. The CFO was persuaded to hire a tax leader for the business. The CFO agreed, but said 'I don't know if we have enough issues to keep a person busy full-time.' GE Lighting then hired a tax partner from a leading Cleveland law firm. By the end of the first day – even more so by the end of the first week – the tax partner had identified so many opportunities (and risks) that she and other GE tax professionals were continually busy for months. The CFO quickly acknowledged that he should have hired a tax leader many years earlier."

[6] We interviewed a former senior tax partner of a Big 4 accounting firm, a tax partner and a tax director of another Big 4 firm, and a tax partner of a non-Big 4 accounting firm. Two of the tax partners have also worked as senior tax executives in large corporations, one as Head of Tax and the other as Tax Director. The interviews were conducted in person and ranged from 46 minutes to 67 minutes. The interviews were transcribed professionally and checked for accuracy by one of the authors. The interview questions are in Appendix 1.

compliance is very important" (2). In terms of tax departments' role, the interviewees commented that tax planning and compliance are "very much driven by the in-house tax team" (2), and "if you have a lot of very experienced people in tax function, they want to be seen as doing high value-added work" (2). The interviews provide support for our arguments that having a larger tax department enables firms to be more effective in saving taxes and reducing tax risk.

Hence, we expect a positive (negative) association between in-house tax department size and tax avoidance (tax risk).[7] Our first two hypotheses are stated as (in alternative form):

HYPOTHESIS 1. *Firms' in-house tax department size is positively associated with tax avoidance.*

HYPOTHESIS 2. *Firms' in-house tax department size is negatively associated with tax risk.*

While on average, tax departments work on both tax planning and tax compliance, they can vary in their relative focus on, and resource allocation between, planning and compliance. The interviewees confirmed this notion. One commented that "there are two types: one is the defensive mode, [and the other] is the offensive mode" (4). The companies that take an "offensive mode" focus more on tax planning – "they want to show savings to the company" (4). The companies that take the "defensive mode" focus more on tax compliance, to "make sure that everything is in compliance … and defend tax position" (4). As such, to enrich the analyses, we examine how tax departments' focus incrementally affects tax avoidance and tax risk. We expect that tax departments with a tax planning focus are more effective in tax planning, further increasing tax avoidance. Similarly, tax departments with a tax compliance focus are more

[7] Apart from internal tax spending, firms can obtain tax services (planning or compliance) from accounting firms, consulting firms, and law firms. If firms with small tax departments spend more on such external tax services, we might not be able to find evidence consistent with Hypothesis 1 and Hypothesis 2.

effective in managing tax risk, further reducing tax risk.[8] Our final two hypotheses are stated as (in alternative form):

HYPOTHESIS 3. *Holding tax department size constant, firms with tax departments that have more of a tax planning focus than a tax compliance focus have incrementally higher tax avoidance.*

HYPOTHESIS 4. *Holding tax department size constant, firms with tax departments that have more of a tax compliance focus than a tax planning focus have incrementally lower tax risk.*

3. Data and Research Design

Sample and Data

Sample and Data Collection

We collect information on corporate tax employees from LinkedIn, a professional networking website that has over 300 million members and hosts the homepages of more than three million firms worldwide. Because financial firms likely have different tax strategies from other firms, we start with the 1,204 non-financial firms in the S&P 1500 index in 2014 and then exclude 131 firms that did not have a LinkedIn company page in 2014.

For each sample firm, we search for LinkedIn members who have worked for or are working for the firm (i.e., current or past employees). We limit the employees to the full time employees whose current or past job titles are related to the income tax function. Based on the individual employees' work history, we construct a panel data of in-house tax departments over the 2009-2014 period, containing year, firm, and individual tax employee information (including job title in the year, educational background, and prior work experience). Appendix 2 describes

[8] Note that we intend to capture the relative focus of tax departments. That is, tax departments that have a tax planning focus still perform both tax planning and compliance, but allocate relatively more resources to tax planning than to tax compliance. Similarly, tax departments that have a tax compliance focus perform both tax planning and compliance, but allocate relatively more resources to tax compliance than to tax planning.

our data collection from LinkedIn in more detail.

We collect financial data from COMPUSTAT. The final sample consists of 5,921 firm-years, covering 42,868 employee-years over the 2009-2014 period. The sample used for various regressions can be smaller due to additional data requirements.

LinkedIn *Data Coverage Validation*

A concern with the LinkedIn data is whether its coverage of tax employees is comprehensive. We use three independent sources to assess the tax employee coverage of LinkedIn. Specifically, we compare our data with: 1) the Tax Executive Institute (TEI) survey in 2012, 2) the Klassen et al. (2017) (hereafter KLM) survey, and 3) interviews with senior executives of three sample firms. The comparisons suggest that the LinkedIn coverage is reasonably comprehensive. First, the TEI survey reports an average of 10.6 tax employees for the largest companies from the U.S., Canada, Europe, and Asia (p. 15). This is close to the average tax department size of 11 for S&P 500 firms in our sample, which represents the group of sample firms that is most comparable to the TEI firms in firm size. Second, the estimated tax department size is on average 13.9 for the KLM firms for which we have total assets information and can reasonably estimate tax department size. The average tax department size is 11.6 based on LinkedIn for our sample firms that are matched on total assets with the KLM firms. Third, for the three interviewed sample firms, the tax department size based on LinkedIn is very close to the numbers given by their senior executives. Please see Appendix 2 for detailed discussions.

These validation tests help increase our confidence in the LinkedIn data. At the same time, we acknowledge that the potential incompleteness of data may introduce noises into the analyses. However, we do not have any strong reason to believe that it introduces systematic bias to our

tests.[9]

Proxies for In-house Tax Investments

We measure a firm's overall in-house tax investments by the size of its tax department, calculated as the total number of tax employees (*TAX_TOTAL*). This measure captures whether the firm has a sufficient number of personnel with adequate tax knowledge. Since *TAX_TOTAL* is positively correlated with firm size, we use a scaled measure, *INHOUSE_TAX*, which is measured as *TAX_TOTAL* divided by the firm's total number of employees (in thousands), in the regressions to control for the size effect.

Panel A of Table 1 presents the descriptive statistics of *TAX_TOTAL* and *INHOUSE_TAX*. The average number of tax employees (*TAX_TOTAL*) is 7.24. *INHOUSE_TAX* has a mean of 0.85, implying that on average about 0.085% of a firm's employees work in the income tax function. About 15% of the sample (892 firm-years) do not have tax departments.[10] Excluding those observations from the analyses leads to qualitatively similar results, as shown in Table S1 of the online Appendix.

[Insert Table 1 here]

Panel B of Table 1 presents the descriptive statistics by firm size, industry, and year. As expected, the number of tax employees increases monotonically with firm size, but the scaled measure decreases with firm size, reflecting the economy of scale in the tax function. The number of tax employees varies across industries, ranging from 5.19 for Utilities to 14.28 for

[9] LinkedIn company coverage and employee coverage might vary across industries. Our sample's industry composition is similar to S&P 1500 and COMPUSTAT firms. To address the concern that the likelihood of employees having LinkedIn accounts might vary across industries or over time, we include industry and year fixed effects in all regressions. In addition, in a robustness check, we use an industry-and-size adjusted measure of tax department size and obtain the same inferences.

[10] Compared to firms with tax departments, those without tax departments are much smaller, are less likely to have foreign operations, have lower leverage and fewer segments, and are less likely to use auditor-provided tax services (untabulated).

Tele Transmission. The scaled measure also shows a large variation across industries, ranging from 0.46 for Consumer Durables to 1.39 for Energy. Therefore, it is important to control for industry fixed effects in the regressions. Over time, the number of tax employees increases steadily, while the scaled measure is similar across years.

Panel C of Table 1 presents the characteristics of tax employees at the employee-year level. The data shed some light on the composition of a typical tax department. On average, a tax department has about seven employees (averages reported in the text are at the firm-year level and are not tabulated). It is led by about two tax executives, in charge of three tax managers and two tax analysts. Our interviews with tax experts suggest that tax executives typically report to the CFO and occasionally to the CEO. The tax department is usually located in a firm's headquarters state (78% of the time) or in a neighboring state, which we determine based on the employee's location reported in LinkedIn in comparison with the firm's headquarters. The tax employees are well-educated in the related fields. For an average firm, among the seven tax employees, around four have an undergraduate degree in accounting, and around five have a graduate degree; three with tax-related graduate degrees such as MTax or JD (Juris Doctor), two with other business-related graduate degrees. In addition, about two tax employees have Certified Public Accountant or Chartered Accountant qualifications.

With respect to work experience, about three out of the seven tax employees have worked in accounting firms (mostly Big N accounting firms). About one of the seven tax employees has previously worked in a corporate tax department at the manager and above level, and about one of the seven tax employees has work experience in law firms, financial institutions, or the IRS/Treasury.

We also examine the experience of individual tax employees to better understand their

career paths using LinkedIn data. The data (untabulated) suggests that on average, a tax analyst holds the same position for three and half years, a tax manager for four and half years, and a tax executive for five and half years, before moving to a higher position (in the same category or the next category) in the same firm or a new firm. On average, it takes a tax analyst about eight years to become a tax manager, and another four years to become a tax executive. The data also suggests that tax is a relatively specialized field, especially at the higher level. About 30% of tax analysts come from a non-tax background, but when they switch jobs, only about 17% switch to a non-tax position. About 22% of tax executives come from a non-tax background, but when they switch jobs, only about 10% move to a non-tax position (e.g., controller, VP finance, CFO).

Identifying Tax Departments' Relative Focus: Planning or Compliance

We use two approaches to identify tax departments' relative focus. The first approach is based on the idea of "tone at the top" – whether the most senior tax executive's job title includes 'planning' or 'compliance'. The most senior tax executive's title likely reflects how he/she and the tax department are evaluated and how the resources are allocated.[11] We construct two indicator variables, one for tax planning focus (*PLANNING1*) and one for tax compliance focus (*COMPLIANCE1*). *PLANNING1* is one for tax departments whose most senior tax executive has a planning title and zero otherwise; *COMPLIANCE1* is one for tax departments whose most senior tax executive has a compliance title and zero otherwise. As reported in panel A of Table 2, 11% of the tax departments are classified as having more of a tax planning focus and 9% as having more of a tax compliance focus. We assume that the rest of the companies' tax

[11] The tax experts interviewed by us confirmed the importance of "tone at the top." For example, one commented that whether to focus on tax planning or compliance "really much depends on the tax director in the organization (2)." Separately, the most senior tax executive usually holds the title of Chief Tax Officer, VP Tax, Tax Director, or Head of Tax. For tax departments with multiple executives who have similar titles, we use professional prefixes such as "Senior" to identify the most senior executive (e.g., Senior VP Tax, Senior Tax Director).

departments do not have a specific focus.

[Insert Table 2 here]

The second approach takes into account all the tax employees' specialization. Specifically, we first construct a tax planning (compliance) score. Tax planning score is calculated as

$$\frac{\#Planning\ Executive \times 3 + \#Planning\ Manager \times 2 + \#Planning\ Analyst}{\#\ Tax\ Executive \times 3 + \#Tax\ Manager \times 2 + \#Tax\ Analyst},$$

where: *#Planning Executive* (*Manager*, *Analyst*) is the number of tax executives (managers, analysts) with "planning" in their job titles, and *#Tax Executive* (*Manager*, *Analyst*) is the total number of tax executives (managers, analysts). Tax compliance score is calculated similarly. We use different weights for executives, managers, and analysts to reflect their differential effect on tax decisions.[12] We then classify a tax department as having more of a tax planning (compliance) focus if the tax department is ranked in the top decile of the tax planning (compliance) score. Accordingly, the indicator variable *PLANNING2* (*COMPLIANCE2*) is set as one for tax departments with more of a tax planning (compliance) focus and zero otherwise.

To better understand the nature and scope of tax planning and compliance, and to substantiate our definitions of tax planning and compliance, we also collect from LinkedIn the job descriptions of 50 (50) randomly selected tax employees whose titles contain "tax planning" ("tax compliance"). Panel A (B) of Appendix 3 summarizes the most commonly used terms for those tax planning (compliance) employees. Tax planning employees most often mention corporate structure and reorganization (62%), M&A and asset dispositions (56%), transfer pricing (24%), and foreign earnings repatriation (16%). About 28% of tax planning employees state that their goal is to minimize ETR and tax payments. In comparison, tax compliance

[12] Using the ratio of the average annual salary of tax executives, tax managers, and tax analysts (2.5/1.8/1) as the weights leads to the same inferences.

employees most often mention tax return filings (80%), tax-related financial reporting (64%), tax return audits (62%), and tax related internal controls (30%). About 36% of tax compliance employees mention that they work toward achieving target ETR and tax obligations. In sum, the job descriptions support the notion that tax planning involves multiple planning strategies to reduce tax payments and tax compliance helps the firms to fulfill tax law and reporting requirements and reduce tax risk.

Proxies for Tax Avoidance and Tax Risk

Our main proxy for tax avoidance is cash ETR. To mitigate the measurement issues of the single-year measure, we use the three-year average cash ETR (*CashETR3*), calculated as the sum of a firm's total cash taxes paid over a three-year period (t, t+1, and t+2), divided by the sum of its total pre-tax book income (excluding special items) over the same period (Dyreng et al. 2008). Following prior studies (e.g., Guenther et al. 2017; McGuire et al. 2013), our main proxy for tax risk is the volatility of cash ETR, *SD_CashETR*, calculated as the standard deviation of annual cash ETR over a three-year period (t, t+1, and t+2).

Panel A of Table 2 reports the descriptive statistics. The sample firms have a mean *CashETR3* of 24% and a mean *SD_CashETR* of 10%, comparable to the numbers reported in prior studies (e.g., Dyreng et al. 2008; Guenther at al. 2017; McGuire et al. 2013).[13]

Regression Specifications

To test Hypothesis 1 and Hypothesis 2, we estimate the following equation:

$$\textit{Tax Avoidance or Tax Risk} = \beta_0 + \beta_1\, \textit{INHOUSE\_TAX} + \boldsymbol{\gamma}\, \textbf{\textit{Controls}} + \textit{Industry, Year Fixed Effects} + \varepsilon \quad (1)$$

The independent variable of interest is *INHOUSE_TAX*. Hypothesis 1 and Hypothesis 2 predict

[13] Throughout the analyses, we require the denominator for tax rate, pre-tax book income (net of special items), to be positive. Observations with a negative denominator are dropped.

its coefficient, β_1, to be negative when the dependent variable is *CashETR3* and *SD_CashETR*.

Following prior research, we include a number of firm characteristics associated with tax outcomes (e.g., Dyreng et al. 2008; Guenther at al. 2017; McGuire et al. 2013; Mills et al. 1998). Specifically, we control for firm size (*SIZE*), pre-tax profitability (*ROA*), market-to-book ratio (*MTB*), leverage (*LEV*), property, plant, and equipment (*PPE*), R&D expenditures (*R&D*), intangible assets (*INTANG*), inventory (*INVENTORY*), an indicator for loss carry forward (*NOL*), change in loss carry forward (Δ*NOL*), an indicator for foreign operations (*FOR_DUMMY*), income from foreign operations (*FOR_INCOME*), the natural logarithm of the number of business segments (*LN_SEGMENTS*), an indicator for internal control weakness (*ICW_DUMMY*), an indicator for the use of auditor-provided tax services (*TAXFEES_DUMMY*), and industry and year fixed effects. Following De Simone et al. (2015) and Guenther et al. (2017), we also include the level of tax avoidance (*CashETR3*) and the volatility of pre-tax return on assets (*SD_ROA*) in the tax risk regression. To be consistent with the measurement of tax avoidance and tax risk, we measure the control variables as the three-year average over the same period.[14] Appendix 4 describes variable measurements. ETR measures are winsorized at 0 and 1, and all other continuous variables are winsorized at the 1st and 99th percentiles.

Controlling for Potential Endogeneity

An important concern with our analyses is that in-house tax investments are likely endogenously determined. The size of a firm's tax department is possibly affected by firm characteristics that determine the amount of tax planning and compliance work desired by the

[14] Note that in-house tax investment (*INHOUSE_TAX*) is an annual measure. Using the three-year average leads to the same inferences. As a robustness check, we add additional control variables including firm age, sales growth, advertising expenditures, equity income, minority interest's earnings, tax heavens, and estimated tax benefits associated with option-based compensation (Gleason and Mills 2011; Lisowsky 2010). The inferences remain the same.

firm (e.g., Klassen et al. 2016; Mills et al. 1998). These characteristics might also affect tax avoidance and tax risk measures. To address this concern, we include a comprehensive list of control variables in equation (1). In addition, we use the control function approach to address endogeneity (Wooldridge 2015). Specifically, we add to equation (1) the residuals from the following determinant model of *INHOUSE_TAX*:

$$INHOUSE\_TAX = \alpha_0 + \alpha_1 TAX\_EDUCATION + \boldsymbol{\theta}\ \boldsymbol{Controls} + Industry,\ Year\ Fixed\ Effects + \varepsilon \quad (2)$$

The instrumental variable (IV) in equation (2) is *TAX_EDUCATION*, the number of tax graduate programs in 2004 in the state of the firm's headquarters.[15] We hand-collect the number of tax graduate programs (including law or accounting programs with a taxation concentration) in each state. This variable satisfies the relevance criteria because the size of a firm's tax department is affected by the firm's access to tax professionals, which is in turn affected by the number of tax graduate programs in the firm's headquarters state.[16] This variable also satisfies the exclusion criteria because it is measured in 2004 and is unlikely to be affected by individual firms' tax outcomes five to ten years later. In fact, many of the tax graduate programs were established well before 2004. In equation (2), in addition to the IV, we include the control variables from equation (1).

Appendix 5 presents results for the determinant model. The coefficient on *TAX_EDUCATION* is significantly positive (t = 5.56), consistent with our argument that it is

[15] As reported in Table S2 of the online Appendix, we use the number of tax programs, scaled by the number of employees of all firms headquartered in the same state as the firm, as the IV to control for the differential demand for tax employees across states. The inferences remain the same for both H1 and H2.

[16] To substantiate this conjecture, we examine tax professionals working for companies with headquarters in two large states, California and Texas, in 2014. Of the 320 tax professionals with a tax or law graduate degree working for companies headquartered in California in our sample, 107 (33%) obtained their tax or law degrees from California. Of the 135 tax professionals with a tax or law degree working for companies headquartered in Texas in our sample, 48 (36%) obtained their tax or law degrees from Texas. These percentages are much higher than the percentage of all U.S. tax and law graduate programs that are in California or Texas. Only 15.6% and 6.1% of tax and law programs in the U.S. are in California and Texas, respectively.

easier for firms headquartered in states with a larger number of tax programs to recruit tax employees. The partial F-statistic (untabulated) is 30.91, greater than the critical value of 8.96 for one instrument (Larcker and Rusticus 2010), indicating that the weak instrument problem is not a big concern. With respect to other variables, we find that *INHOUSE_TAX* decreases with firm size (*SIZE*), consistent with economy of scale in tax investments (Mills et al. 1998; Slemrod and Venkatesh 2002). Firms with higher *ROA*, leverage (*LEV*), *R&D*, *NOL*, and more segments (*LN_SEGMENTS*), and firms with foreign operations (*FOR_DUMMY*) and auditor-provided tax services (*TAXFEES_DUMMY*) have more tax employees. Firms with more intangible assets (*INTANG*), inventory, and foreign income (*FOR_INCOME*) have fewer tax employees.[17] The adjusted R^2 of the model is 0.31.

Larcker and Rusticus (2010) argue that no instrumental variables are perfect and results based on weak instrumental variables might not be as robust as those based on OLS regressions. Thus, following their suggestion, we report results using both the OLS regression and the control function approach for the main tests. Obtaining similar results from the two approaches will give us confidence in the inferences.

4. Empirical Results

Descriptive Statistics

Panel A of Table 2 presents descriptive statistics for the regression variables. On average, the sample firms have total assets (*SIZE*) of 10,742 million, *ROA* of 10%, market-to-book ratio

[17] The significantly negative coefficient on foreign income seems counter-intuitive since certain tax planning activities (such as transfer pricing) are related to foreign income. However: (1) we have controlled for the overall firm profitability and the existence of foreign operations, both of which have significantly positive coefficients; and (2) foreign income can be affected by firms' tax planning strategies. When we use foreign sales (deflated by total sales) instead of foreign income in this regression, the coefficient on foreign sales is insignificant.

(*MTB*) of 3.22, leverage (*LEV*) of 20% (of total assets), *PPE* of 30% (of total assets), *R&D* of 3% (of total assets), intangible assets (*INTANG*) of 25% (of total assets), inventory of 8% (of total assets), foreign income (*FOR_INCOME*) of 3% (of total assets), and 8.29 business segments (*SEGMENTS*). Of the sample firms, 52% have loss carry forward (*NOL*), 61% have positive foreign income (*FOR_DUMMY*), 2% report internal control weaknesses (*ICW_DUMMY*), and 81% use tax services provided by their auditors (*TAXFEES_DUMMY*). The mean standard deviation of ROA (*SD_ROA*) is about 4%. On average, there are about eight tax graduate programs in the firm's headquarters state (*TAX_EDUCATION*).

Panel B of Table 2 presents the Pearson correlations among the explanatory variables. Most of the correlations are small, except that *FOR_DUMMY* is highly correlated with *FOR_INCOME* (0.55) and *LN_SEGMENTS* (0.46), which is not surprising given that these variables capture similar aspects of firm operations. *PPE* and *INTANG* are significantly negatively correlated (–0.43). An analysis of the variance inflation factors indicates that multicollinearity is not a major issue.

In-house Tax Investment and Tax Avoidance and Tax Risk: Test of Hypothesis 1 and Hypothesis 2

Table 3 reports tests of Hypothesis 1 and Hypothesis 2, with Columns (1) and (2) based on the control function approach and Columns (3) and (4) based on OLS regressions. Column (1) of Table 3 presents the test of Hypothesis 1 with *CashETR3* as the dependent variable. The coefficient on *INHOUSE_TAX* is significantly negative ($t = -3.17$). This indicates that greater in-house tax investment is associated with more tax savings, consistent with Hypothesis 1. The effect is also economically significant; moving from the first quartile (0.15) to the third quartile (1.04) of *INHOUSE_TAX* (see Panel A, Table 1) is associated with a reduction in *CashETR3* of

0.8 percentage points [(1.04 – 0.15) × (–0.0091)], or a relative decrease of 3.3%.[18]

[Insert Table 3 here]

In terms of control variables, we find that cash ETR decreases with firm size (*SIZE*), leverage (*LEV*), *R&D*, PPE, intangible assets (*INTANG*), inventory, *NOL*, and foreign income (*FOR_INCOME*), and it increases with pre-tax profitability (*ROA*), existence of foreign operations (*FOR_DUMMY*), the number of segments (*LN_SEGMENTS*), presence of internal control material weaknesses (*ICW_DUMMY*), and the indicator for using auditor-provided tax services (*TAXFEES_DUMMY*). The coefficients on the control variables are similar to those reported in prior studies (e.g., Gallemore and Labro 2015; Hoopes et al. 2012; Robinson et al. 2010).

Column (2) of Table 3 reports the test of Hypothesis 2 using the standard deviation of annual cash ETR (*SD_CashETR*) to proxy for tax risk. The results indicate that *INHOUSE_TAX* is significantly negatively associated with *SD_CashETR* ($t = –2.51$). Consistent with Hypothesis 2, firms that invest more in their tax departments have lower tax risk. In terms of economic significance, moving from the first to the third quartile of *INHOUSE_TAX* is associated with a reduction in *SD_CashETR* of 1.7 percentage points [(1.04 – 0.15) × (–0.0189)], or a relative decrease of 17%.

In terms of control variables, we find that tax risk decreases with firm size (*SIZE*), profitability (*ROA*), intangible assets (*INTANG*), existence of foreign operations

[18] Alternatively, given the mean number of employees (untabulated, 24.26, in thousands), the coefficient of –0.0091 suggests that having one additional tax employee is associated with a reduction in *CashETR3* of 0.038 percentage points [(1/24.26) × (–0.0091)]. This reduction would translate into an annual cash tax saving of about $341,050 [0.038% × 897.5 million, the sample average pre-tax income (untabulated)]. To put this into perspective, the average annual base salary for a tax manager in the U.S. is $114,933 in 2016 (untabulated), according to Salary.com. This calibration raises the question why some firms appear to "leave money on the table" by not hiring additional tax employees. This may be due to frictions in the labor market for certain firms and years. Moreover, there are potential costs associated with tax planning, such as reputational costs, political costs, and adverse media attention (Balakrishnan et al. 2019; Graham et al. 2014).

(*FOR_DUMMY*), foreign income (*FOR_INCOME*), and the use of auditor-provided tax services (*TAXFEES_DUMMY*), and it increases with leverage (*LEV*), *R&D*, PPE, *NOL*, the number of segments (*LN_SEGMENTS*), cash ETR (*CashETR3*), and the volatility of ROA (*SD_ROA*). Columns (3) and (4) of Table 3 report the OLS regression results. The inferences remain the same. In sum, we find that both cash ETR and tax risk decrease with the size of tax departments. As tax departments become larger, firms allocate more resources to both tax planning and compliance, leading to lower tax rate and lower tax risk.

In-house Tax Departments' Focus and Tax Avoidance and Tax Risk: Test of Hypothesis 3 and Hypothesis 4

To test Hypothesis 3 and Hypothesis 4, we add the two indicators for tax department focus to equation (1):[19]

$$CashETR3 = \beta_0 + \beta_1 INHOUSE\_TAX + \beta_2 PLANNING + \beta_3 COMPLIANCE + \boldsymbol{\gamma}\ \textbf{Controls} + Industry,\ Year\ Fixed\ Effects + \varepsilon \quad (3a)$$

$$SD\_CashETR = \beta_0 + \beta_1 INHOUSE\_TAX + \beta_2 COMPLIANCE + \beta_3 PLANNING + \boldsymbol{\gamma}\ \textbf{Controls} + Industry,\ Year\ Fixed\ Effects + \varepsilon \quad (3b)$$

To test Hypothesis 3, we use equation (3a) where the dependent variable is *CashETR3*, the proxy for tax avoidance; we expect the coefficient on *PLANNING* (β_2) to be negative. To test Hypothesis 4, we use equation (3b) where the dependent variable is *SD_CashETR*, the proxy for tax risk; we expect the coefficient on *COMPLIANCE* (β_2) to be negative.

While Hypothesis 3 and Hypothesis 4 pertain to the intended effect of tax department focus, it is also important to understand whether there is a trade-off between tax avoidance and tax risk. On the one hand, there are potential conflicts between tax avoidance and tax risk management (e.g., Graham et al. 2014). A focus on tax planning can make the tax positions less

[19] For this regression, we set *PLANNING* and *COMPLIANCE* as zero for firms without tax departments.

sustainable and thus increase tax risk, and a focus on tax compliance can lead to forgoing tax planning opportunities, reducing tax avoidance. On the other hand, Guenther et al. (2017) argue that greater tax avoidance is not necessarily associated with higher tax risk because firms can undertake more "conventional" tax avoidance activities. Thus, to shed light on this debate, we also include *COMPLIANCE* when explaining tax avoidance (equation (3a)) and *PLANNING* when explaining tax risk (equation (3b)). We do not have predictions for their coefficients.

Panel A of Table 4 presents the tests of Hypothesis 3 based on the control function approach, with Column (1) using the first classification of planning/compliance focus (i.e., *PLANNING1* and *COMPLIANCE1*) and Column (2) using the second classification (i.e., *PLANNING2* and *COMPLIANCE2*). We continue to find a significantly negative coefficient on *INHOUSE_TAX* in both columns (t = –2.54 and –2.55, respectively). More importantly, consistent with Hypothesis 3, we find that the coefficient on *PLANNING* is significantly negative in both columns (t = –2.37 and –2.41, respectively). This indicates that tax departments with more of a planning focus are associated with additional tax savings. In addition, the coefficient on *COMPLIANCE* is significantly positive in both columns (t = 2.57 and 4.20, respectively), suggesting that tax departments with more of a compliance focus have incrementally higher tax rates. This is consistent with a trade-off between tax planning and compliance.

[Insert Table 4 here]

Panel B of Table 4 reports the tests of Hypothesis 4 based on the control function approach, with Column (1) using the first classification of planning/compliance focus and Column (2) using the second classification. We continue to find a significantly negative coefficient on *INHOUSE_TAX* in both columns (t = –2.49 and –2.51, respectively). More importantly, consistent with Hypothesis 4, the coefficient on *COMPLIANCE* is significantly negative in both

columns (t = –2.20 and –2.02, respectively). This indicates that tax departments with more of a compliance focus are associated with incrementally lower tax risk. In addition, the coefficient on *PLANNING* is significantly positive in both columns (t = 2.01 and 2.58, respectively), suggesting that tax departments with more of a planning focus have incrementally higher tax risk, consistent with a trade-off between tax planning and compliance.

Overall, the above results suggest that after controlling for tax department size, tax departments with more of a planning focus are associated with incrementally greater tax avoidance, but at the cost of higher tax risk; tax departments with more of a compliance focus are associated with incrementally lower tax risk, but at the cost of higher tax rate.[20]

Factors associated with In-house Tax Departments' Relative Focus

In this section, we conduct an exploratory analysis to understand why some tax departments focus relatively more on tax planning or compliance. We limit the analyses to the firm-years with tax departments and run the following logit regression:

$$INHOUSE\_TAX\_FOCUS = \boldsymbol{\beta X} + Industry,\ Year\ Fixed\ Effects + \varepsilon \quad (4)$$

We examine the determinants of tax planning and tax compliance focus separately. For tax planning (compliance) focus, we compare the tax departments with a tax planning (compliance) focus and the benchmark group, i.e., tax departments with no specific focus, and the dependent variable is *PLANNING1* (*COMPLIANCE1*).[21] We consider the following five aspects that may be associated with tax departments' focus: (1) firm complexity, (2) firms' reputation concerns, (3) shareholder incentives, (4) firms' desire to reduce tax expenses, and (5) firms' desire to reduce tax risk. Table 5 reports the regression results. Appendix 4 provides detailed variable

[20] Given the potential endogeneity of tax department focus, this analysis may be confounded by unobservable firm characteristics that are correlated with both tax department focus and tax outcomes.
[21] The inferences remain similar if we use *PLANNING2* and *COMPLIANCE2*.

measurements.

[Insert Table 5 here]

First, we use firm size (*SIZE*), the existence and size of foreign operations (*FOR_DUMMY*, *FOR_INCOME*), and the number of business segments (*LN_SEGMENTS*) to capture firm complexity. We find that, compared with other firms, complex firms (i.e., larger firms, firms with more foreign income, and firms with more segments) are more likely to have a tax planning focus; complex firms (i.e., larger firms, firms with foreign operations, and firms with more segments) are also more likely to have a tax compliance focus. This is consistent with heterogeneity among complex firms – some complex firms, by taking advantage of complex firm structure, can have more tax planning opportunities, while other complex firms have more complicated compliance issues.

Second, we use the amount of advertising expenditures (*ADVERTISING*) to capture firms' reputation concerns. We find that firms with greater reputation concerns are less likely to focus on tax planning and are more likely to focus on tax compliance, consistent with reputation concerns deterring firms from engaging in aggressive tax planning (Austin and Wilson 2017; Chow et al. 2016; Dyreng et al. 2016; Hanlon and Slemrod 2009).

Third, we use institutional ownership (*INST_OWN*) and managerial ownership (*MGMT_OWN*) to capture shareholder incentives. We find that firms with higher managerial ownership are more likely to focus on tax planning and firms with higher institutional ownership are less likely to focus on tax compliance. This is generally consistent with institutional ownership and managerial ownership aligning managers' interest with shareholders' incentives to save taxes (e.g., Chen et al. 2019; Khan et al. 2017; Rego and Wilson 2012).

Fourth, we use profitability (*ROA*), financial constraints (*KZ_INDEX*), leverage (*LEV*), capital investments (*PPE*), R&D expenditures (*R&D*), and an indicator for higher than industry-average cash ETR *in the past* (*LAG_CASHETR_POS*), to capture variation in firms' incentives to save taxes. We find that firms that are more financially constrained (those with higher *KZ_INDEX*) and firms with a higher tax rate compared to industry peers *in the past* (*LAG_CASHETR_POS*) are more likely to focus on tax planning, consistent with greater pressure upon these firms to save taxes (Bird et al. 2018; Edwards et al. 2016; Law and Mills 2015). We also find that firms with higher leverage (*LEV*), more fixed assets (*PPE*), and more R&D are less likely to focus on tax planning, consistent with debt, capital investments, and R&D expenditures providing firms with tax benefits such as interest tax deduction, capital cost allowance, and R&D tax credits, and reducing the need for tax planning.

Lastly, we use return volatility (*RETVOL*), restructuring (*RESTRUCT*), an indicator for high tech firms (*HIGHTECH*), and an indicator for higher than industry-average cash ETR volatility *in the past* (*LAG_SDCASHETR_POS*), to capture variation in firms' incentives to reduce tax risk. We find that these variables are all positively associated with the tax compliance focus, suggesting that firms with high return volatility, firms that undergo restructuring, high-tech firms, and firms with higher cash ETR volatility than industry peers *in the past* have stronger incentives to reduce tax risk (Dyreng et al. 2017; Guenther et al. 2017).

In sum, the above analyses suggest that firms' relative focus on tax planning or compliance is systematically related to firm complexity, firms' reputation concerns, shareholder incentives, and firms' desire to reduce tax expenses and tax risk.

5. Additional Analyses and Sensitivity Tests

Prior External Work Experience of Tax Employees

In this section, we explore the incremental effect of prior external work experience of tax employees on tax outcomes. Tax employees with prior experience in accounting or law firms can gain expertise from serving a large number of clients. Such expertise can benefit a firm's internal tax planning and compliance. In fact, the job postings for tax employees often emphasize prior experience in public accounting or law firms as a desirable attribute.[22]

To investigate the incremental effect of prior work experience in public accounting and law firms, we construct two variables: *INHOUSE_TAX_ACCFIRM* and *INHOUSE_TAX_LAWFIRM,* which are measured as the number of tax employees with past experience in accounting firms and law firms, respectively, scaled by the firm's total number of employees (in thousands). We add these two variables to equation (1). Since these two variables are components of *INHOUSE_TAX*, the coefficients on these variables capture the incremental effect of tax employees' prior accounting and law firm experience.

Table 6 reports results using the control function approach. The results in Column (1) suggest that prior work experience in public accounting firms (*INHOUSE_TAX_ACCFIRM*) has a significant incremental negative effect on tax avoidance ($t = –2.46$).[23] The results in Column (2) suggest that prior work experience in law firms (*INHOUSE_TAX_LAWFIRM*) has a significant incremental negative effect on tax risk ($t = –2.19$). Overall, the findings suggest that tax employees' prior work experience in public accounting and law firms contribute

[22] For examples, see http://www.accountingjobstoday.com/cm/Job-Descriptions/tax-manager.html, or https://www.glassdoor.sg/Job/tax-director-jobs-SRCH_KO0,12.htm.

[23] An untabulated analysis indicates that firms that have more tax employees with accounting firm experience are not more likely to use auditor-provided tax services. Thus, the coefficient on *INHOUSE_TAX_ACCFIRM* is not capturing the effect of external tax services.

incrementally to a firm's tax planning and compliance.

[Insert Table 6 here]

In-house Tax Departments and the Use of Auditor-Provided Tax Services

Other than its in-house tax team, a firm can also use external tax services, including those provided by its auditor. Prior research finds that auditor-provided tax services help firms to realize greater tax savings (Klassen et al. 2016; McGuire et al. 2012) and improve tax-related internal control (De Simone et al. 2015).

Given that both in-house tax departments and auditors can reduce tax rate and risk, the impact of tax departments on tax planning and compliance outcomes may be lower when the auditor also provides tax services. At the same time, tax departments and auditors might complement each other in tax planning and compliance, since the two teams' knowledge and skills can be complementary. If that is the case, we will expect the opposite. The tax experts we interviewed suggested that either substitution or complementarity effects between in-house tax departments and external tax service providers are possible. One mentioned that "there are some tax directors who see [tax service providers] as competitors" (4), while another commented that "it's always working together between their advisors and the in-house team, because the in-house team will not have expertise from a global standpoint" (1).

To shed light on the interplay between internal and external tax investments, we add the interaction of *INHOUSE_TAX* and an indicator for the use of auditor-provided tax services (*TAXFEES_DUMMY*) to equation (1). [24, 25] Table 7 reports the regression results, Column (1) for

[24] There is no publicly available data on external tax services provided by non-auditors. Hence, this cross-sectional test only focuses on the interplay between in-house tax investments and auditor-provided tax services.
[25] As reported in panel B of Table 2, the two variables are not significantly correlated with each other. Separately, the inferences remain the same if we use the natural logarithm of (one plus) the amount of tax fees paid to the auditor, or if we use the ratio of tax fees to total fees paid to the auditor. These results are untabulated.

tax avoidance and Column (2) for tax risk. As shown in Column (1), the coefficient on *INHOUSE_TAX* remains significantly negative. The coefficient on *INHOUSE_TAX* × *TAXFEES_DUMMY* is significantly positive ($t = 2.21$). This result indicates that the effect of in-house tax investments on tax avoidance is less when the firm also uses auditor-provided tax services.

[Insert Table 7 here]

With respect to tax risk, as reported in Column (2), the coefficient on *INHOUSE_TAX* remains significantly negative. The coefficient on *INHOUSE_TAX* × *TAXFEES_DUMMY* is significantly positive ($t = 3.11$). This result suggests that the effect of in-house tax investments on tax risk is also less when the firm uses auditor-provided tax services.

Overall, the above results suggest that in-house tax investments and auditor-provided tax services are substitutes. This finding provides some justification for GE's decision of moving its in-house global tax team to PwC, announced in January 2017.[26] Most of GE's tax employees became PwC employees, but they continued to help GE with tax issues, together with those who remained at GE. Even though GE substantially reduced the size of its in-house tax team, doing so may not have negatively affected the effectiveness of GE's tax decisions, given our finding that internal tax investments and external tax services appear to be substitutes.

Change Analyses

We conduct change analyses to provide additional causal evidence on the link between in-house tax investments and both tax avoidance and tax risk. Based on equation (1), we use the following specification for change analyses:

$$\Delta Tax\ Avoid_t \text{ or } \Delta Tax\ Risk_t = \beta_0 + \beta_1\, \Delta INHOUSE\_TAX_{t-1} + \boldsymbol{\gamma}\, \boldsymbol{\Delta Controls_t} + Industry,\ Year\ Fixed\ Effects + \varepsilon \quad (5)$$

[26] "GE Tax Trade: Sending Hundreds of Accountants to PwC." *The Wall Street Journal*, January 12, 2017.

The independent variable of interest is $\Delta INHOUSE\_TAX_{t-1}$. We use the lagged change (from *t*–2 to *t*–1) because we want to examine the impact of the change in the number of tax employees on *subsequent* tax avoidance and tax risk measures. We measure the change in tax avoidance as the change in annual cash ETR (from year *t*-1 to year *t*), rather than the change in three-year tax rate, because the change in annual tax rate better captures the immediate effect of the change in tax investments, if any.[27] We use the same control variables as in equation (1), except that we use annual changes in the control variables.

Panel A of Table 8 reports the results. For the analysis of *ΔCashETR* (Column (1)), the coefficient on *ΔINHOUSE_TAX* is significantly negative (*t* = –2.51), indicating that increases in tax investments lead to a subsequent reduction in cash ETR. For the analysis of *ΔSD_CashETR* (Column (2)), the coefficient on *ΔINHOUSE_TAX* is also significantly negative (*t* = –2.36), indicating that increases in tax investments lead to a subsequent decrease in tax risk.

[Insert Table 8 here]

To shed light on the potentially differential effects of hiring additional tax professionals and losing existing tax professionals, we separately examine the positive and negative changes in tax investments. We define two change variables: $\Delta^{+}INHOUSE\_TAX$ and $\Delta^{-}INHOUSE\_TAX$, which are equal to *ΔINHOUSE_TAX* when the change is positive and negative, respectively, and zero otherwise. Columns (3) and (4) of Table 8, panel A, report the regression results. In both columns, the coefficient on $\Delta^{+}INHOUSE\_TAX$ is significantly negative (*t* = –2.37 and –2.12, respectively), but the coefficient on $\Delta^{-}INHOUSE\_TAX$ is insignificant. These results suggest that hiring additional tax professionals leads to a subsequent decrease in tax rates and tax risk, but the

[27] Based on a survey of tax executives, Hoopes et al. (2012, p. 1610) report that "12 percent of tax positions could be changed within a month, 39.6 percent within six months, 69.2 percent within one year, 91.25 percent within two-to-three years, and 100 percent within three-to-five years."

departure of existing tax professionals does not significantly affect the next year's tax avoidance or risk. This may be because once a firm's tax planning and compliance strategies are in place, tax outcomes might not be influenced by the departure of some tax employees in the short run.

Robustness Checks: Alternative Specifications, Proxies, and Non-linearity

To ensure that the results are robust, we conduct a series of sensitivity tests. First, while a key benefit of the control function approach is its simplicity, a drawback of the approach is its stronger assumptions compared to the IV approach. Hence, we use the IV approach as an alternative way to address endogeneity. We estimate the determinant model of *INHOUSE_TAX* (equation (2)) together with equation (1) using the generalized method of moments (GMM) approach.[28] As reported in panel B of Table 8, we continue to find a significantly negative association between *INHOUSE_TAX* and both tax rate and tax risk, consistent with the main findings.

Second, we use an un-scaled measure of in-house tax investments– the industry-and-size adjusted number of tax employees; *ADJ_INHOUSE_TAX_COUNT* is defined as the number of tax employees in the firm minus the average number of tax employees of its industry-size-matched peers.[29] The analyses, as reported in panel C of Table 8, lead to the same inferences.

Third, we use alternative proxies for tax avoidance and tax risk, including: (i) the industry-and-size-adjusted measures (*AdjCashETR3* and *AdjSD_CashETR*) (Balakrishnan et al. 2019), (ii) tax avoidance and tax risk measures based on GAAP effective tax rates (*GAAP_ETR3* and

[28] The GMM approach has benefits similar to those of the system of simultaneous equations (Cameron and Trivedi 2005); the inferences are the same if we use the two-stage least squares (2SLS) approach.

[29] We obtain the same inferences when using an expenditure-based measure, calculated as the total annual salary of the firm's tax employees deflated by total assets. The total salary of a firm's tax employees is calculated as the sum of the salary of individual tax employees, which is estimated as the average salary of employees with the same job title who work for firms in the same industry and with the same headquarters location, as reported by Payscale.com, a major human capital data provider in the U.S. We find similar results using salary information from Salary.com. These results are untabulated.

SD_GAAP_ETR), (iii) the three-year average of book-tax differences (*BTD3*) for tax avoidance and future tax settlements of uncertain tax benefits (*LEAD_SETTLE3*) for tax risk, and (iv) tax avoidance and tax risk measures based on Henry and Sansing (2018) (Δ*/MVA3* and *SD*(Δ*/MVA*)). The results, as reported in panels D and E of Table 8, lead to the same inferences.

Fourth, to capture the potential non-linear effect of in-house tax department size on tax avoidance and tax risk, we add the squared term of tax department size ($INHOUSE\_TAX^2$) to the main regressions and report the results in panel F of Table 8. We find that the coefficient on $INHOUSE\_TAX^2$ is significantly positive in the tax rate regression, suggesting that cash ETR decreases with tax department size at a decreasing rate. In the tax risk regression, the coefficient on $INHOUSE\_TAX^2$ is positive, but it is insignificant at conventional levels.

In addition, prior studies examine the effect of internal control material weaknesses on tax avoidance and document that the remediation of internal control material weaknesses increases tax avoidance (e.g., Bauer 2016; De Simone et al. 2015; Lynch 2014). Unlike those studies, we focus on the overall impact of internal tax investments on tax planning and compliance, whereas addressing internal control weaknesses is only one of the many mechanisms through which internal tax investments can facilitate tax planning and compliance. To ensure that our results are not driven by internal control weaknesses, we control for internal control weaknesses throughout the analyses. Also, as reported in Table S3 of the online Appendix, we obtain the same inferences after excluding observations with internal control weaknesses, about 2% of the sample firm-years.

Accounting employees and tax avoidance/tax risk

We also examine whether the size of a firm's accounting department affects tax avoidance and tax risk. An insignificant association between the number of accounting (non-tax) employees and tax avoidance and tax risk will increase our confidence in the documented link between tax

employees and tax outcomes, assuming that confounding factors affect accounting department and tax department size similarly. Thus this test can serve as a placebo test. At the same time, we recognize the possibility that accounting staff in small firms may handle tax-related issues due to a lack of dedicated tax employees. Hence we conduct the analyses separately for S&P 500, S&P 400, and S&P 600 firms. We collect data on accounting employees from LinkedIn and include both tax department size and accounting department size (not including tax employees) in explaining tax avoidance and tax risk.

Table 9 reports the regression results. As shown in the table, the coefficients on *INHOUSE_TAX* remain significantly negative for all three groups of firms. The accounting department size (*INHOUSE_ACC*) is not significantly associated with tax avoidance or tax risk for S&P 500 and S&P 400 firms, although it is significantly associated with lower cash ETR and lower tax risk for S&P 600 firms. The findings suggest that for small firms, accounting employees also contribute towards tax planning and compliance.[30] More importantly, the findings help strengthen our inferences on the link between in-house tax employees and the effectiveness of tax decisions.

[Insert Table 9 here]

6. Conclusion

This study examines the impact of a firm's in-house tax investments on tax avoidance and tax risk. Using data on corporate tax employees hand-collected from LinkedIn for a sample of 5,921 firm-years from non-financial S&P 1500 firms over the 2009-2014 period, we find that more in-house tax investments are associated with significantly greater tax avoidance and lower

[30] In Table S4 of the online Appendix, we add the interaction of *INHOUSE_TAX* and *INHOUSE_ACC* to the regressions. The coefficient on the interaction is insignificant for S&P 500 and S&P 400 firms and significantly negative for S&P 600 firms, suggesting a synergy between tax and accounting employees in reducing tax rate and tax risk for small firms.

tax risk. Using tax employees' specialization to identify tax departments' relative focus on tax planning or compliance, we find evidence consistent with a trade-off between tax planning and tax compliance. Tax departments with more of a tax planning focus have an incrementally lower tax rate but higher tax risk, and tax departments with more of a tax compliance focus have incrementally lower tax risk but a higher tax rate. We also explore the determinants of tax departments' relative focus and find that firm complexity, reputation concerns, managerial ownership, and firms' desire to reduce tax rates and tax risk are systematically related to tax departments' focus.

We contribute to the literature by looking inside the "black box" of corporate in-house tax departments and by providing comprehensive evidence on the effect of tax departments' size and focus on tax avoidance and tax risk. Our analyses are important to practitioners, corporations, and academia in providing a better understanding of how in-house human capital tax investment impacts tax outcomes. Our findings suggest that such investment brings benefits including lower tax rate and lower tax risk.

The study is subject to the following caveats. First, both the size and relative focus of tax departments are endogenous. For tax department size, we address the endogeneity using the number of tax programs in the firm's headquarters state as the instrumental variable. Nevertheless, we cannot rule out the possibility that our analyses are still affected by endogeneity. For tax department focus, we cannot find a suitable instrumental variable. As such, readers should interpret the results from the tax department focus analyses with caution. Second, since our analyses rely on self-reported LinkedIn data, potential data issues such as incompleteness introduce noises into our analyses. While data validity checks suggest that LinkedIn coverage is reasonably comprehensive, as discussed in Section 3, readers should keep

data limitations in mind when interpreting our findings. Third, because we do not consider implicit taxes, our findings only illustrate the effect of corporate tax departments on explicit taxes. Lastly, our analyses focus on the benefits of having a large in-house tax department—reducing tax rates and tax risk. We do not consider the costs associated with being tax aggressive such as reputational costs, political cost, and adverse media attention (Balakrishnan et al. 2019; Graham et al. 2014). Therefore, our analyses cannot be used to infer the optimality of in-house tax department size.

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APPENDIX 1

Interview questions

A. Corporate in-house tax departments
   1. Personnel
      a. What are typical size and composition of in-house tax departments?
      b. Who is usually the most senior executive in charge of tax matters?
      c. Where do firms usually hire people for tax matters?
      d. Are accounting department employees sometimes involved in tax matters?
   2. Tax planning
      a. How do firms usually approach tax planning?
      b. Can you give some examples how firms engage in tax planning?
   3. Tax compliance
      a. How do firms usually approach tax compliance?
      b. Can you give some examples on this?
   4. Tax planning vs. compliance
      a. Are the two activities equally important for firms, and if not, what factors affect firms' decision to focus on one versus the other?
      b. Are the two activities in conflict in terms of strategies or human resource allocations?
      c. Are employees designated to work exclusively on tax planning vs. tax compliance?

B. External tax service providers vs. in-house tax departments
   5. External tax service providers
      a. How often do firms use external tax service providers for tax services?
      b. Besides accounting firms, who are the major players in providing external tax services?
      c. What are some of the main considerations firms have when approaching potential external tax service providers?
      d. What kind of firms are more likely to use external tax service providers?
   6. Type of tax work
      a. Do firms rely on external tax service providers mainly for tax planning, tax compliance, or certain aspects of each area?
      b. How do in-house tax departments and external tax service providers work together? Do they work on the same area from different angles or work on different areas?
      c. What are some advantages vs. disadvantages of using external tax service providers vs. in-house tax departments?

APPENDIX 2
Data collection from LinkedIn and data validation

Data collection

Our data collection begins with identifying a list of non-financial S&P 1500 companies in 2014 (with a LinkedIn company page) as our sample firms. For each sample firm, we use LinkedIn to search for LinkedIn members who have worked for or are working for the firm (i.e., current or past employees). We limit the members to those whose current or past job titles contain the keyword "tax." [31] We exclude the tax employees whose jobs are temporary, such as tax clerks and tax interns (about 26%). We further exclude the tax employees whose job titles indicate that they do not work in the corporate income tax function, such as those with job titles related to property tax, sales tax, or payroll tax (about 12%). The above steps provide us with a sample of individuals who currently work or previously worked in a corporate income tax position in one of our sample firms. The search results provide the name, picture (if available), current and past job titles and employers, and educational background of tax employees.

Since our individual-level data contains both current and past tax employees of the sample firms, we are able to construct the tax departments of the sample firms in 2014 and prior years, as long as the tax employees have LinkedIn accounts that include their work history. Going too far back in time, however, can introduce more estimation errors due to missing past tax employees. For example, some tax employees who worked in the tax departments in the earlier years may no longer be working and might not have a LinkedIn account. Some may not list all their earlier work experience. Hence we use 2009 as the start of our sample period since it is not too far back and still allows us to have a sufficiently large sample for empirical analyses. Using a

[31] We do not restrict our search to those members who work in the accounting and finance function because depending on the organization structure, firms may have tax employees in other divisions (e.g., legal). We thank Michelle Hanlon for this suggestion.

different starting year (specifically, one or two years before, or one or two years later) leads to the same inferences.

Based on the individual-level data, we construct a dataset containing year, firm, and the individual tax employees who work for the firm in a given year. The final sample consists of 5,921 firm-years, covering 42,868 individual-years over the 2009-2014 period. Based on job titles, we group the tax employees into three categories: tax analysts, tax managers, and tax executives. Specifically, tax analysts include those with job titles including "Tax Analyst," "Tax Specialist," "Corporate Tax Accountant," or "Tax Associate." Tax managers include those with job titles including "Tax Manager," "Tax Lawyer," "Tax Attorney," or "Tax Accounting Manager." Tax executives include those with job titles including "Chief Tax Officer," "VP Tax," "Tax Director," "Head of Tax," or "Tax Counsel." The size of a company's in-house tax departments is the total number of tax analysts, tax managers, and tax executives. We also collect information on tax employees' educational background, professional designation (e.g., CPA or CA), and work experience.

Data validation

Since it is important to assess the extent of the tax employee coverage of LinkedIn, we conduct three independent validation tests, comparing our data with: 1) the 2012 Tax Executive Institute (TEI) survey, 2) the Klassen, Lisowsky, and Mescall (2017) (hereafter KLM) survey, and 3) interviews of senior executives of three sample firms.

1. Comparison with the 2012 TEI survey. The TEI conducted a survey of 500 chief tax officers around the world and summarized the responses in the TEI's 2011-2012 Corporate Tax Department Survey. This survey shows that on average there are 10.6 tax employees for the largest companies in the U.S., Canada, Europe, and Asia. Because the TEI survey is for the

largest companies in the world, we believe that S&P 500 firms within our sample are most comparable to the surveyed firms. The average number of tax employees is 11 for our S&P 500 sample firms in 2012, which is similar to the average of 10.6 tax employees reported by the TEI (p. 15).

2. Comparison with the KLM survey. KLM conducted a survey on corporate tax issues related to transfer pricing in collaboration with the TEI in 2010. As part of the survey, the respondents were asked a question related to their tax department size:

> How many full time tax personnel are employed companywide?
>
> Category 1 [≤5]; Category 2 [6-10]; Category 3 [11-20];
>
> Category 4 [21-50]; Category 5 [51-100]; Category 6 [>100]

We obtained the KLM survey responses to the above question with firm identity hidden. [32] Among the 208 respondents to this question, 69 are public firms with total asset information. A limitation of the KLM survey is that the respondents only indicated the range (see above) of their tax department size. For firms in the last two categories, it is difficult to come up with reasonable estimates of their average tax department size, given the small number of firms in these two categories (three and four, respectively) and the wide or open-ended range. Hence we exclude those seven firms. We focus on the remaining 62 firms (hereafter the KLM firms) for comparison purposes.

We compare the tax department size of the KLM firms with our sample firms matched on total assets. For each KLM firm, we find all of our sample firms with total assets in the [98%, 102%] range of the KLM firm's total assets. Note that for each KLM firm, there can be several matched firms. The following table compares the tax department size between the KLM firms

[32] We thank Ken Klassen, Pete Lisowksy, and Devan Mescall for sharing the data with us.

and the matched sample firms. For the KLM firms, we assume that the average tax department size for firms in each category is the midpoint of the range. For the matched sample firms, we use their tax department size based on LinkedIn in 2010, when the KLM survey was conducted. As reported, for Category 1, the mean tax department size is 2.5 for the KLM firms and 4.7 for the matched sample firms; for Category 2, the means are 8 and 6.7; for Category 3, the means are 15.5 and 11.2; and for Category 4, the means are 35.5 and 28.7. For the four categories combined, the mean tax department size is 13.9 for the KLM firms and 11.3 for the matched sample firms. The average difference of 2.6 is about 19% of the average tax department size of the KLM firms.

Response Category in the KLM Survey [number of tax employees]	KLM survey responses		Matched sample firms		
	Number of firms	Midpoint of the range (1)	Number of firms	Mean Tax department size per LinkedIn (2)	Difference (2) – (1)
Category 1 [≤5]	20	2.5	128	4.7	+2.2
Category 2 [6–10]	16	8	127	6.7	–1.3
Category 3 [11–20]	12	15.5	90	11.2	–4.3
Category 4 [21–50]	14	35.5	83	28.7	–6.8
Mean tax department size across the firms		13.9		11.3	-2.6

3. Comparison with interviews of senior executives of three sample firms. Lastly, we compare the tax department size per LinkedIn with the interview responses of senior executives of three sample firms. We contacted 15 sample firms for interviews related to tax departments. Some firms did not respond to our request and some declined the request for privacy reasons. Three firms agreed to phone interviews, including one airline (Director for Financial Reporting),

one manufacturer of durable goods (Vice President and Controller), and one wholesale firm (Senior Vice President and Controller).

The following table reports the number of tax employees in these firms per the interviewed executives and based on LinkedIn in February 2019 (the time of the interviews). We also report the firm size quintile and the industry of the firms, using the same definitions as in Table 1. As reported, the tax department sizes from the two sources are very close to each other. For firm A, the number of tax employees is 12 and 10 from the two sources; for firm B, 5 and 5; and for firm C, 31 and 32. The mean difference of -0.3 is small.

	Firm Size Quintile	Fama-French 12 Industries	Number of tax employees per the interviews (1)	Number of tax employees per LinkedIn (2)	Difference (2) – (1)
Firm A (airline)	4	Others (Mining, Construction, Transportation, etc.)	12	10	-2
Firm B (manufacturing)	3	Consumer Durables	5	5	0
Firm C (wholesale)	5	Wholesale, Retail	31	32	+1
Average across the three firms			16	15.7	-0.3

The above validation tests suggest that the tax department size estimated using LinkedIn data is smaller than, but close to, the actual tax department size based on surveys and interviews. Hence we conclude that the coverage of tax employees in LinkedIn is reasonably comprehensive.

APPENDIX 3

Job descriptions of tax planning and tax compliance employees

Panel A: Tax planning employees

Job description terms	Number of tax employees	Percentage
Corporate structure and reorganization ("Recommended and implemented a new holding company structure in France to allow company to minimize its tax liability.")	31	62%
M&A and asset dispositions ("Managed tax planning and due diligence efforts in the tax planning area for acquisitions as well as dispositions.")	28	56%
Minimizing ETR and tax payments ("Developed, evaluated, and managed federal and international tax planning strategies to minimize the Company's effective tax rate and maximize cash flow.")	14	28%
Transfer pricing ("Assisting in the design, review, and implementation of transfer pricing methodologies for the global organization.")	12	24%
Foreign earnings repatriation ("Evaluated tax planning strategies to repatriate foreign earnings to the U.S. in a tax-efficient manner.")	8	16%
Others (Tax planning issues related to compensation, tax efficient financing transactions, foreign tax credit planning, or capital loss utilization.)	14	28%

Panel B: Tax compliance employees

Job description terms	Number of tax employees	Percentage
Tax return filings ("Responsible for preparing all U.S. federal and state income and franchise tax filings on a timely basis.")	40	80%
Tax-related financial reporting ("Management of tax accounting and reporting (US GAAP, IFRS, local country), including review and preparation of the worldwide tax provision.")	32	64%
Tax return audits ("Managed all federal and state direct and indirect tax audits.")	31	62%
Target ETR or tax payment estimation ("Establish target ETR and ensure achievement of such target.")	18	36%
Tax related internal controls ("Successfully remediated a pre-existing significant deficiency in the income tax accounts. Rewrote and ensured compliance with Sarbanes-Oxley including identifying and monitoring key tax controls.")	15	30%
Others (Tax compliance issues related to foreign tax credits, repatriation, complex transactions, or R&D tax credits.)	8	16%

Notes: From LinkedIn, we randomly select 50 corporate tax employees whose job titles include 'planning' and 50 corporate tax employees whose job titles include 'compliance,' over our sample period 2009-2014. This table reports the most commonly used terms in the job descriptions, with panel A for tax planning employees and panel B for tax compliance employees. For each commonly used term, we also include one example in parentheses for illustration.

APPENDIX 4
Variable definitions

Variables	Definitions
In-house Tax Department	
TAX_TOTAL	The total number of in-house tax employees of a firm per LinkedIn.
INHOUSE_TAX	The total number of in-house tax employees (*TAX_TOTAL*), divided by the total number of employees of the firm (in thousands).
PLANNING1	An indicator variable that equals 1 if the most senior tax executive has "planning" in his/her job title, such as "Director of Tax Planning" or "VP Tax Planning," and 0 otherwise.
COMPLIANCE1	An indicator variable that equals 1 if the most senior tax executive has "compliance" in his/her job title, such as "Director of Tax Compliance" or "VP Tax Compliance," and 0 otherwise.
PLANNING2	An indicator variable that equals 1 if the firm is in the top decile of *PLANNING_SCORE*, which is calculated as: (*#Planning Executive* ×3 + *#Planning Manager* ×2 + *#Planning Analyst*) / (*# Tax Executive* ×3 + *#Tax Manager* ×2 + *#Tax Analyst*), where *#Planning Executive* (*Manager*, *Analyst*) is the number of tax executives (managers, analysts) with "planning" in their job titles and *#Tax Executive* (*Manager*, *Analyst*) is the total number of tax executives (managers, analysts).
COMPLIANCE2	An indicator variable that equals 1 if the firm is in the top decile of *COMPLIANCE_SCORE*, which is calculated as: (*#Compliance Executive* ×3 + *#Compliance Manager* ×2 + *#Compliance Analyst*) / (*# Tax Executive* ×3 + *#Tax Manager* ×2 + *#Tax Analyst*), where # *Compliance Executive* (*Manager*, *Analyst*) is the number of tax executives (managers, analysts) with "compliance" in their job titles and *#Tax Executive* (*Manager*, *Analyst*) is the total number of tax executives (managers, analysts).
Δ*INHOUSE_TAX*	Change in *INHOUSE_TAX*, from year *t*–2 to *t*–1.
Tax Avoidance and Tax Risk	
CashETR3	Three-year average cash effective tax rate, calculated as the sum of the firm's cash tax paid over three years (year *t, t+1, and t+2*) divided by the sum of its total pre-tax book income (excluding special items) over the same period. Observations with a negative denominator are dropped from the analyses. *CashETR3* is winsorized at 0 and 1.
CashETR	Annual cash effective tax rate, calculated as cash tax paid divided by total pre-tax book income (excluding special items). Observations with a negative denominator are dropped from the analyses. *CashETR* is winsorized at 0 and 1.
SD_CashETR	Standard deviation of annual *Cash ETR* over three years (year *t, t+1, and t+2*).
Δ*CashETR*	Change in *CashETR* from year *t*–1 to year *t*.
Δ*SD_CashETR*	Change in *SD_CashETR* from year *t*–1 to year *t*.
Control Variables in the Analyses of Tax Avoidance and Tax Risk	

SIZE	Average total assets over three years. We use the natural logarithm of average total assets in the regressions.
ROA	Average pre-tax income (excluding special items) over three years divided by average lagged assets over the same period.
MTB	Average market value of equity over three years divided by the average book value of common equity over the same period.
LEV	Leverage, calculated as the average long-term debt over three years divided by average lagged assets over the same period.
R&D	Average research and development expenditures over three years divided by average lagged assets over the same period.
PPE	Capital intensity, calculated as the average net property, plant, and equipment over three years divided by average lagged assets over the same period.
INTANG	Average intangible assets over three years divided by average lagged assets over the same period.
INVENTORY	Average inventory over three years divided by average lagged assets over the same period.
NOL	An indicator variable for loss carry forward, set as 1 if the loss carry forward is nonzero in any of the three years and 0 otherwise.
ΔNOL	Average change in loss carry forward over three years divided by average lagged assets over the same period.
FOR_DUMMY	An indicator variable for positive foreign income, set as 1 if the average three-year foreign income is positive and 0 otherwise.
FOR_INCOME	Average foreign income over three years divided by average lagged assets over the same period.
LN_SEGMENTS	The natural logarithm of one plus *SEGMENTS*, which is the average number of business segments over three years.
ICW_DUMMY	An indicator variable for the presence of internal control material weaknesses, set as 1 if the firm reports a SOX 404 or 302 material weakness in internal control in any of the three years and 0 otherwise. Source: *Audit Analytics*.
TAXFEES_DUMMY	An indicator variable for the use of auditor-provided tax services, set as 1 if the firm reports positive tax fees paid to its auditor in any of the three years and 0 otherwise. Source: *Audit Analytics*.
SD_ROA	Standard deviation of pre-tax return on assets (excluding special items) over three years.
Instrumental Variable	
TAX_EDUCATION	The number of tax graduate programs (e.g., LLM in Tax and MS in Tax) offered by the universities in the state of the firm's headquarters in 2004. Source: *U.S. News Education, TaxTalent, TaxProf Blog, and universities' websites*.

Additional Variables for the Determinants of Tax Departments' Focus

ADVERTISING	Average advertising expenditures over three years divided by average lagged assets over the same period.
INST_OWN	The number of shares owned by institutional investors as a percentage of the number of shares outstanding.
MGMT_OWN	The number of shares owned by the CEO as a percentage of the number of shares outstanding.
KZ_INDEX	Cash constraint index as developed in Kaplan and Zingales (1997), calculated as -1.002(Cash Flow/K) + 0.283Q + 3.139(Debt/Total Capital) – 39.368 (Dividends/K) – 1.315(Cash/K), where K = net PPE and Q = (total shareholders' equity + market capitalization – common equity – deferred tax assets)/ total shareholders' equity. A higher KZ Index indicates that the firm is more cash constrained.
LAG_CASHETR_POS	An indicator variable for higher past cash ETR, set as 1 if the industry-size adjusted three-year cash ETR measured from year t–3 to t–1 is positive and 0 otherwise.
RETVOL	Return volatility, measured as the standard deviation of daily returns during the year.
RESTRUCT	An indicator variable for firms that undergo restructuring, set as 1 if the firm reports non-zero restructuring changes in any of the three years and 0 otherwise.
HIGHTECH	An indicator variable for firms in the high-tech industries (Bhojraj and Lee 2002), set as 1 for firm-year in the following industries: biotechnology (SIC codes 2833-2836 and 8731-8734), computer, computer programming, data process (3570-3577 and 7370-7379), electronics (3600-3674) and telecommunication (4810-4841), and 0 otherwise.
LAG_SDCASHETR_POS	An indicator variable for higher past tax risk, set as 1 if the industry-size adjusted three-year *SD_CashETR* measured from year *t*–3 to *t*–1 is positive and 0 otherwise.

Notes: The data source is COMPUSTAT, unless otherwise noted.

APPENDIX 5
Determinants of corporate tax department size

	INHOUSE_TAX
TAX_EDUCATION	0.0239***
	(5.56)
SIZE	-0.2230***
	(-16.37)
ROA	0.4674*
	(1.88)
MTB	0.0028
	(0.42)
LEV	0.4765***
	(3.79)
PPE	-0.1020
	(-0.76)
R&D	1.0420**
	(2.00)
INTANG	-0.2931***
	(-3.52)
INVENTORY	-1.0461***
	(-5.32)
NOL	0.0737**
	(2.14)
Δ*NOL*	-0.3359
	(-0.60)
FOR_DUMMY	0.1111*
	(1.88)
FOR_INCOME	-3.8606***
	(-5.72)
LN_SEGMENTS	0.0748*
	(1.88)
ICW_DUMMY	0.0702
	(0.53)
TAXFEES_DUMMY	0.0770*
	(1.80)
Year + Industry FEs	Included
N	5,921
Adj. R^2	0.31

Notes: This table reports the OLS regression results of the determinants of *INHOUSE_TAX* based on 5,921 firm-years from S&P 1500 firms with available data over the 2009-2014 period. See Appendix 4 for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on standard errors clustered by both firm and year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

TABLE 1
Descriptive statistics on tax department size and tax employees

Panel A: Descriptive statistics on tax department size

	N	Mean	S.D.	Q1	Median	Q3
TAX_TOTAL	5,921	7.24	10.99	1.00	4.00	8.00
INHOUSE_TAX	5,921	0.85	1.18	0.15	0.45	1.04

Panel B: Descriptive statistics on tax department size by firm size, industry, and year

Firm Size Quintile	Mean *Total Assets* (*Billions*)	N	Mean *TAX_TOTAL*	Mean *INHOUSE_TAX*
1	0.41	1,185	1.79	1.29
2	1.14	1,184	2.93	0.93
3	2.67	1,184	4.68	0.83
4	7.01	1,184	8.04	0.66
5	42.50	1,184	18.74	0.53
Fama-French 12 Industries				
FF1 Consumer Non-Durables		443	6.15	0.59
FF2 Consumer Durables		168	5.68	0.46
FF3 Manufacturing		902	6.96	0.64
FF4 Energy – Extraction and Products		263	7.25	1.39
FF5 Chemicals and Allied Products		245	8.42	0.91
FF6 Business Equipment		1,183	8.56	1.20
FF7 Tele Transmission		163	14.28	1.25
FF8 Utilities		304	5.19	0.82
FF9 Wholesale and Retail		833	7.54	0.53
FF10 Healthcare, Medical Equipment, and Drugs		570	6.07	1.04
FF12 Others		847	6.06	0.72
Year				
2009		961	6.16	0.83
2010		966	6.68	0.86
2011		985	7.13	0.86
2012		1,007	7.38	0.85
2013		1,009	7.75	0.85
2014		993	8.25	0.86

TABLE 1 (Cont'd)

Panel C: Tax employee characteristics

	Number of Employee-years	Percentage of Full Sample
Full Sample	42,868	100%
Seniority		
Tax Executives	11,022	26%
Tax Managers	18,457	43%
Tax Analysts	13,389	31%
Educational Background and Qualifications		
Undergraduate Degree in Accounting	24,987	58%
MTax or MAcc (Tax Concentration)	12,425	29%
JD (Juris Doctor) or LLM (Master of Laws) in Tax Law	5,717	13%
Other Graduate Degrees in Business	12,689	30%
CPA (Certified Public Accountant) /CA (Chartered Accountant)	10,643	25%
Prior Work Experience		
BIG N Accounting Firms	15,730	37%
As a Tax Partner	453	1%
As a Tax Manager	7,374	17%
Non-BIG N Accounting Firms	2,135	5%
Law Firms	3,155	7%
Financial Institutions	1,371	3%
IRS or Treasury	1,018	2%
Other Corporate Tax Departments (Manager or above)	6,452	15%

Notes: Our full sample includes 5,921 firm-years from S&P 1500 firms with available data over the 2009-2014 period. This table presents the descriptive statistics on tax department size for the full sample (panel A) and by firm size, industry, and year (panel B). It also presents the descriptive statistics on tax employee characteristics (panel C), including the seniority, educational background, qualifications, and prior work experience of tax employees. There are 42,868 employee-year observations for the 5,921 sample firm-years. We classify tax employees into tax analysts, tax managers, and tax executives based on their self-reported profiles on LinkedIn. Tax executives include those with job titles "Chief Tax Officer," "VP Tax," "Tax Director," "Head of Tax," or "Tax Counsel." Tax managers include those with job titles "Tax Manager," "Tax Lawyer," "Tax Attorney," or "Tax Accounting Manager." Tax analysts include those with job titles "Tax Analyst," "Tax Specialist," "Corporate Tax Accountant," or "Tax Associate." Note that prior work experience sums to less than one across the categories because we only count these specific types of experience. See Appendix 4 for variable definitions.

TABLE 2
Descriptive statistics on regression variables

Panel A: Descriptive statistics on firm characteristics

	N	Mean	S.D.	Q1	Median	Q3
PLANNING1	5,029	0.11	0.33	0.00	0.00	0.00
COMPLIANCE1	5,029	0.09	0.28	0.00	0.00	0.00
PLANNING2	5,029	0.10	0.30	0.00	0.00	0.00
COMPLIANCE2	5,029	0.10	0.30	0.00	0.00	0.00
CashETR3	5,921	0.24	0.14	0.14	0.24	0.31
SD_CashETR	5,660	0.10	0.09	0.05	0.08	0.13
SIZE (*in millions*)	5,921	10,742	24,109	860	2,585	8,659
ROA	5,921	0.10	0.10	0.05	0.09	0.15
MTB	5,921	3.22	4.94	1.58	2.36	3.74
LEV	5,921	0.20	0.19	0.05	0.18	0.30
PPE	5,921	0.30	0.25	0.10	0.21	0.42
R&D	5,921	0.03	0.05	0.00	0.00	0.03
INTANG	5,921	0.25	0.24	0.05	0.19	0.39
INVENTORY	5,921	0.08	0.11	0.00	0.02	0.12
NOL	5,921	0.52	0.50	0.00	1.00	1.00
Δ*NOL*	5,921	0.01	0.02	0.00	0.00	0.00
FOR_DUMMY	5,921	0.61	0.49	0.00	1.00	1.00
FOR_INCOME	5,921	0.03	0.04	0.00	0.01	0.04
SEGMENTS	5,921	8.29	4.30	5.00	8.00	10.00
ICW_DUMMY	5,921	0.02	0.15	0.00	0.00	0.00
TAXFEES_DUMMY	5,921	0.81	0.40	1.00	1.00	1.00
SD_ROA	5,921	0.04	0.06	0.01	0.03	0.05
TAX_EDUCATION	5,921	7.92	7.35	2.00	8.00	12.00

TABLE 2 (Cont'd)

Panel B: Correlation table for control variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1)	*INHOUSE_TAX*																
(2)	*SIZE*	-0.22															
(3)	*ROA*	-0.04	-0.07														
(4)	*MTB*	0.01	-0.03	0.29													
(5)	*LEV*	-0.05	0.27	-0.17	-0.03												
(6)	*PPE*	-0.04	0.21	-0.06	-0.09	0.29											
(7)	*R&D*	0.17	-0.19	0.02	0.13	-0.25	-0.31										
(8)	*INTANG*	-0.04	0.09	-0.07	-0.01	0.20	-0.43	0.02									
(9)	*INVENTORY*	-0.09	-0.08	0.02	-0.05	-0.11	-0.15	-0.09	-0.17								
(10)	*NOL*	0.04	0.00	-0.12	-0.02	0.03	-0.22	0.10	0.17	0.01							
(11)	Δ*NOL*	0.00	0.04	-0.02	-0.01	0.01	0.03	0.00	0.02	-0.01	0.06						
(12)	*FOR_DUMMY*	0.00	0.14	0.06	0.02	-0.09	-0.33	0.19	0.16	0.04	0.22	-0.04					
(13)	*FOR_INCOME*	-0.02	0.18	0.25	0.09	-0.13	-0.18	0.22	0.00	-0.02	0.14	0.01	0.55				
(14)	*LN_SEGMENTS*	-0.04	0.29	-0.07	-0.09	-0.02	-0.16	0.05	0.10	-0.03	0.17	0.04	0.46	0.36			
(15)	*ICW_DUMMY*	0.02	-0.08	-0.05	-0.01	0.00	-0.01	0.00	-0.01	0.04	0.03	0.00	-0.04	-0.04	-0.01		
(16)	*TAXFEES_DUMMY*	-0.02	0.16	-0.01	0.02	0.04	-0.06	0.02	0.07	-0.02	0.07	0.01	0.17	0.12	0.13	0.02	
(17)	*SD_ROA*	0.04	-0.15	-0.28	0.01	-0.10	-0.06	0.12	-0.05	-0.08	0.04	0.04	-0.06	-0.08	-0.01	0.04	-0.02

Notes: The full sample includes 5,921 firm-years from S&P 1500 firms with available data over the 2009-2014 period. Panel A presents the descriptive statistics on firm-level characteristics, including tax department focus, tax avoidance and tax risk, and control variables. Note that the statistics for *PLANNING1*, *COMPLIANCE1*, *PLANNING2*, and *COMPLIANCE2* are for firms with tax departments. Panel B reports the Pearson correlations between *INHOUSE_TAX* and the control variables. The correlations in shaded cells are significant at the 0.10 level (based on two-tailed tests). See Appendix 4 for variable definitions.

TABLE 3
In-house tax investments and tax avoidance/tax risk

	Control Function		OLS	
	(1)	(2)	(3)	(4)
	CashETR3	*SD_CashETR*	*CashETR3*	*SD_CashETR*
INHOUSE_TAX	-0.0091***	-0.0189**	-0.0060***	-0.0023**
	(-3.17)	(-2.51)	(-3.51)	(-2.06)
SIZE	-0.0093***	-0.0126***	-0.0087***	-0.0112***
	(-5.98)	(-6.48)	(-5.69)	(-9.65)
ROA	0.2132***	-0.1444***	0.097***	-0.2953***
	(9.17)	(-8.68)	(4.22)	(-15.87)
MTB	-0.0002	-0.0002	-0.0003	-0.0000
	(-0.61)	(-1.14)	(-0.83)	(-0.24)
LEV	-0.0574***	0.0135**	-0.0298***	0.0317***
	(-6.14)	(2.36)	(-3.72)	(4.55)
R&D	-0.4491***	0.1039***	-0.4214***	-0.0371
	(-9.51)	(2.90)	(-8.48)	(-1.18)
PPE	-0.1141***	0.0189**	-0.0753***	0.0058
	(-9.26)	(2.24)	(-5.41)	(0.69)
INTANG	-0.0373***	-0.0356***	-0.0298***	-0.0044
	(-4.16)	(-5.29)	(-3.20)	(-0.73)
INVENTORY	-0.0657***	0.0206	-0.0096	0.0198
	(-2.97)	(1.16)	(-0.43)	(1.30)
NOL	-0.0147***	0.0056**	-0.0197***	0.0046**
	(-4.21)	(2.27)	(-5.57)	(1.97)
Δ*NOL*	0.1088	-0.0621	0.1591**	0.0499
	(1.32)	(-1.59)	(1.98)	(1.25)
FOR_DUMMY	0.0217***	-0.0059*	0.0200***	-0.0086***
	(4.15)	(-1.70)	(3.77)	(-2.63)
FOR_INCOME	-0.5422***	-0.3003***	-0.5080***	-0.1513***
	(-8.99)	(-7.38)	(-8.30)	(-3.55)
LN_SEGMENTS	0.0230***	0.0170***	0.0243***	0.0173***
	(4.99)	(5.81)	(5.13)	(5.98)
ICW_DUMMY	0.0471***	-0.0066	0.0505***	0.0120
	(3.07)	(0.86)	(3.26)	(1.56)
TAXFEES_DUMMY	0.0076*	-0.0054*	0.0086**	-0.0034
	(1.89)	(-1.82)	(2.11)	(-1.23)
CashETR3		0.1844***		0.1602***
		(15.13)		(17.43)
SD_ROA		0.0042***		0.0235***
		(2.61)		(6.50)
STAGE1_RESIDUAL	0.0034	0.0190**		
	(1.06)	(2.54)		
Year + Industry FEs	Included	Included	Included	Included
N	5,921	5,660	5,921	5,660
Adj. R^2	0.24	0.26	0.25	0.21

Notes: This table reports results for the effect of in-house tax investments on tax avoidance and tax risk, using the control function approach to address endogeneity in Columns (1) and (2) and using OLS regressions in Columns (3) and (4). See Appendix 4 for variable definitions. *STAGE1_RESIDUAL* are the residuals estimated from the

determinant model, as reported in Appendix 5. The full sample includes 5,921 firm-years from S&P 1500 firms with available data over the 2009-2014 period. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on standard errors clustered by both firm and year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

TABLE 4
The incremental effect of in-house tax departments' focus

Panel A: Tax departments' focus and tax avoidance (*CashETR3*)

	(1) Classification based on "Tone at the top" (*PLANNING = PLANNING1 COMPLIANCE = COMPLIANCE1*)	(2) Classification based on all tax employees' specializations (*PLANNING = PLANNING2 COMPLIANCE = COMPLIANCE2*)
INHOUSE_TAX	-0.0091**	-0.0091**
	(-2.54)	(-2.55)
PLANNING	-0.0129**	-0.0127**
	(-2.37)	(-2.41)
COMPLIANCE	0.0205**	0.0290***
	(2.57)	(4.20)
SIZE	-0.0081***	-0.0084***
	(-3.66)	(-3.86)
ROA	0.1000***	0.1324***
	(3.58)	(4.61)
MTB	-0.0004	-0.0005*
	(-1.27)	(-1.70)
LEV	-0.0333***	-0.0319***
	(-2.91)	(-3.12)
R&D	-0.3556***	-0.3579***
	(-6.19)	(-6.30)
PPE	-0.0709***	-0.0791***
	(-4.10)	(-4.62)
INTANG	-0.0253**	-0.0369***
	(-2.57)	(-3.52)
INVENTORY	-0.0157	-0.0196
	(-0.65)	(-0.82)
NOL	-0.0102**	-0.0105**
	(-2.46)	(-2.54)
Δ*NOL*	0.0929	0.0952
	(1.20)	(1.23)
FOR_DUMMY	0.0173***	0.0179***
	(2.88)	(2.99)
FOR_INCOME	-0.4646***	-0.4984***
	(-6.69)	(-7.18)
LN_SEGMENTS	0.0297***	0.0301***
	(5.49)	(5.58)
ICW_DUMMY	0.0471***	0.0472***
	(3.15)	(3.15)
TAXFEES_DUMMY	0.0061	0.0063
	(1.39)	(1.44)
STAGE1_RESIDUAL	0.0054	0.0055
	(1.54)	(1.58)
Year + Industry FEs	Included	Included
N	5,921	5,921
Adj. R^2	0.24	0.24

TABLE 4 (Cont'd)
Panel B: Tax departments' focus and tax risk (*SD_CashETR*)

	(1) Classification based on "Tone at the top" (*PLANNING = PLANNING1 COMPLIANCE = COMPLIANCE1*)	(2) Classification based on all tax employees' specializations (*PLANNING = PLANNING2 COMPLIANCE = COMPLIANCE2*)
INHOUSE_TAX	-0.0191**	-0.0192**
	(-2.49)	(-2.51)
COMPLIANCE	-0.0087**	-0.0067**
	(-2.20)	(-2.02)
PLANNING	0.0077**	0.0087***
	(2.01)	(2.58)
SIZE	-0.0120***	-0.0121***
	(-5.92)	(-6.02)
ROA	-0.1575***	-0.1575***
	(-8.64)	(-8.65)
MTB	-0.0006*	-0.0006
	(-1.70)	(-1.58)
LEV	0.0130**	0.0128**
	(2.17)	(2.13)
R&D	0.1275***	0.1305***
	(3.12)	(3.19)
PPE	0.0232**	0.0238***
	(2.52)	(2.58)
INTANG	-0.0387***	-0.0374***
	(-5.43)	(-5.24)
INVENTORY	0.0235	0.0234
	(1.31)	(1.30)
NOL	0.0053**	0.0052**
	(2.18)	(2.13)
Δ*NOL*	-0.0404	-0.0405
	(-0.99)	(-0.99)
FOR_DUMMY	-0.0078**	-0.0077**
	(-2.28)	(-2.26)
FOR_INCOME	-0.2558***	-0.2571***
	(-7.03)	(-7.05)
LN_SEGMENTS	0.0170***	0.0168***
	(5.92)	(5.87)
ICW_DUMMY	0.0020	0.0018
	(0.26)	(0.23)
TAXFEES_DUMMY	-0.0074**	-0.0073**
	(-2.45)	(-2.43)
CashETR3	0.2304***	0.2306***
	(15.23)	(15.25)
SD_ROA	0.0006	0.0008
	(0.63)	(0.81)
STAGE1_RESIDUAL	0.0198**	0.0064***
	(2.56)	(3.19)
Year + Industry FEs	Included	Included

N	5,660	5,660
Adj. R^2	0.26	0.26

Notes: This table reports the regression results of the incremental effect of the tax departments' focus on tax avoidance (panel A) and tax risk (panel B), using the control function approach to address endogeneity. See Appendix 4 for variable definitions. *STAGE1_RESIDUAL* are the residuals estimated from the determinant model, as reported in Appendix 5. The full sample includes 5,921 firm-years from S&P 1500 firms with available data over the 2009-2014 period. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on standard errors clustered by both firm and year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

TABLE 5
Factors associated with tax department's focus – planning or compliance

	(1) *PLANNING1*	(2) *COMPLIANCE1*
	Coeff. (z-stat)	Coeff. (z-stat)
Firm Complexity		
SIZE	1.0498***	0.7526***
	(14.62)	(13.80)
FOR_DUMMY	0.1274	0.7112***
	(0.45)	(4.24)
FOR_INCOME	7.2463***	-2.2144
	(2.77)	(-1.13)
LN_SEGMENTS	0.6928***	0.5113***
	(3.86)	(3.21)
Firm's Reputation Concerns		
ADVERTISING	-7.6053*	9.3585***
	(-1.78)	(5.27)
Shareholder Incentives		
INST_OWN	0.6963	-0.8589**
	(1.29)	(-2.18)
MGMT_OWN	0.4500**	-0.1433
	(2.16)	(-0.81)
Desire to Reduce Tax Expenses		
ROA	2.0842	2.2352***
	(1.38)	(2.95)
KZ_INDEX	0.02088**	0.0037
	(2.25)	(0.74)
LEV	-0.9620**	0.3140
	(-1.96)	(1.06)
PPE	-2.4688***	-1.8831***
	(-3.72)	(-3.61)
R&D	-7.6430**	-1.0811
	(-2.18)	(-0.69)
LAG_CASHETR_POS	0.4033**	-0.1402
	(2.55)	(-0.91)
Desire to Reduce Tax Risk		
RETVOL	19.1112*	18.1994**
	(1.68)	(2.03)
RESTRUCT	-0.0972	0.6845*
	(-0.15)	(1.66)
HIGHTECH	-0.2420	0.5844**
	(-1.01)	(2.44)
LAG_SDCASHETR_POS	0.0168	1.8406***
	(0.12)	(2.70)
Year + Industry FEs	Included	Included
N	4,556	4,495
Pseudo R^2	0.20	0.21

Notes: This table reports results for the determinants of a tax department's focus using Logit regressions. The benchmark group includes firm-years whose tax departments have no specific focus. Column (1) reports the coefficient estimates when comparing tax departments with a tax planning focus (*PLANNING1*=1) and the

benchmark group; Column (2) reports the coefficient estimates when comparing tax departments with a tax compliance focus (*COMPLIANCE1*=1) and the benchmark group. Firm-years without a tax department (i.e., firm-years with no tax employees) are excluded from this analysis. The focus of tax departments is based on the "tone at the top" approach. See Appendix 4 for variable definitions. The z-statistics (in parentheses) are based on standard errors clustered by both firm and year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

TABLE 6
The incremental effect of tax employees' external work experience

	(1)	(2)
	CashETR3	*SD_CashETR*
INHOUSE_TAX	-0.0070**	-0.0217***
	(-2.41)	(-2.75)
INHOUSE_TAX_ACCFIRM	-0.0051**	0.0030
	(-2.46)	(1.35)
INHOUSE_TAX_LAWFIRM	0.0096	-0.0129**
	(1.18)	(-2.19)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	5,921	5,660
Adj. R^2	0.23	0.26

Notes: This table reports the regression results for the incremental effect of tax employees' external work experience on tax avoidance and tax risk, using the control function approach to address endogeneity. See Appendix 4 for variable definitions. Intercepts and control variables are included but not tabulated. The t-statistics (in parentheses) are based on standard errors clustered by both firm and year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. The external work experience variables are defined as follows:

INHOUSE_TAX_ACCFIRM = The total number of tax employees with prior work experience in a public accounting firm, divided by the total number of employees of the firm (in thousands).

INHOUSE_TAX_LAWFIRM = The total number of tax employees with prior work experience in a law firm, divided by the total number of employees of the firm (in thousands).

TABLE 7
In-house tax investments and auditor-provided tax services

	(1) *CashETR3*	(2) *SD_CashETR*
INHOUSE_TAX	-0.0148***	-0.0244***
	(-4.16)	(-3.14)
TAXFEES_DUMMY	-0.0007	-0.111***
	(-0.14)	(-3.32)
INHOUSE_TAX× TAXFEES_DUMMY	0.0074**	0.0064***
	(2.21)	(3.11)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	5,921	5,660
Adj. R^2	0.24	0.27

Notes: This table reports the regression results for the interaction effects of in-house tax investments and auditor-provided tax services, using the control function approach to address endogeneity. See Appendix 4 for variable definitions. Intercepts and control variables are included but not tabulated. The t-statistics (in parentheses) are based on standard errors clustered by both firm and year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

TABLE 8
Alternative specifications and proxies

Panel A: Change analysis

	(1) $\Delta CashETR$	(2) $\Delta SD\_CashETR$	(3) $\Delta CashETR$	(4) $\Delta SD\_CashETR$
$\Delta INHOUSE\_TAX$	-0.0138**	-0.0048**		
	(-2.51)	(-2.36)		
$\Delta^{+} INHOUSE\_TAX$			-0.0170**	-0.0075**
			(-2.37)	(-2.12)
$\Delta^{-} INHOUSE\_TAX$			-0.0025	-0.0011
			(-0.87)	(-0.57)
Control Variables	Included	Included	Included	Included
Year + Industry FEs	Included	Included	Included	Included
N	3,987	3,924	3,885	3,924
Adj. R^2	0.04	0.09	0.04	0.09

Panel B: Alternative specifications - IV estimation

	(1) *CashETR3*	(2) *SD_CashETR*
INHOUSE_TAX	-0.0148***	-0.0161***
	(-3.66)	(-3.78)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	5,921	5,687
Adj. R^2	0.12	0.17

Panel C: Alternative proxy for tax investments

	(1) *ADJ_INHOUSE_TAX_COUNT*	(2) *CashETR3*	(3) *SD_CashETR*
ADJ_INHOUSE_TAX_COUNT		-0.0008***	-0.0006***
		(-3.17)	(-3.32)
TAX_EDUCATION	0.0133***		
	(3.28)		
Control Variables	Included	Included	Included
Year + Industry FEs	Included	Included	Included
N	5,921	5,921	5,660
Adj. R^2	0.17	0.20	0.19

TABLE 8 (Cont'd)

Panel D: Alternative proxies for tax avoidance

	(1) *AdjCashETR3*	(2) *GAAP_ETR3*	(3) *BTD3*	(4) *Δ/MVA3*
INHOUSE_TAX	-0.0073**	-0.0102**	0.0019***	-0.0008**
	(-3.49)	(-3.41)	(3.27)	(-2.11)
Controls Variables	Included	Included	Included	Included
Year + Industry FEs	Included	Included	Included	Included
N	5,921	5,799	5,681	6,054
Adj. R^2	0.21	0.18	0.31	0.12

Panel E: Alternative proxies for tax risk

	(1) *AdjSD_CashETR*	(2) *SD_GAAP_ETR*	(3) *LEAD_SETTLE3*	(4) *SD(Δ/MVA)*
INHOUSE_TAX	-0.0049***	-0.0011***	-0.0151***	-0.0007**
	(-2.60)	(-3.13)	(-2.61)	(-2.55)
Controls Variables	Included	Included	Included	Included
Year + Industry FEs	Included	Included	Included	Included
N	5,687	5,663	4,815	5,781
Adj. R^2	0.21	0.20	0.06	0.32

Panel F: Non-linear relation between tax department size and tax avoidance/tax risk

	(1) *CashETR3*	(2) *SD_CashETR*
INHOUSE_TAX	-0.0197**	-0.0205***
	(-2.49)	(-2.97)
INHOUSE_TAX ^{2}	0.0057*	0.0003
	(1.91)	(1.28)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	5,921	5,660
Adj. R^2	0.24	0.26

Notes: Panel A reports results for the effect of in-house tax investments on tax avoidance and tax risk using OLS change specifications. Δ*CashETR* (Δ*SD_CashETR*) is the change in *CashETR* (*SD_CashETR*) from year t-1 to year t. *ΔINHOUSE_TAX* is the lagged change in *INHOUSE_TAX* (from year t-2 to year t-1). The control variables are the same as in Table 3 except that we use annual changes in the control variables from year t-1 to year t. Columns (3) and (4) separately test the effect of positive and negative changes for in-house tax investments. Δ^{+}*INHOUSE_TAX* = Δ*INHOUSE_TAX* if Δ*INHOUSE_TAX* $\geq$ 0, and 0 otherwise. Δ^{-}*INHOUSE_TAX* = Δ*INHOUSE_TAX* if Δ*INHOUSE_TAX* < 0, and 0 otherwise.

Panel B reports results for the effect of in-house tax investments on tax avoidance and tax risk using the IV estimation. *INHOUSE_TAX* is the predicted value estimated from the determinant model (Appendix 5).

Panel C reports results using an un-scaled measure of in-house tax department size (*ADJ_INHOUSE_TAX_COUNT*) and the control function approach to address endogeneity. *ADJ_INHOUSE_TAX_COUNT* is defined as the firm's number of tax employees minus the average number of tax employees of firms with similar size (the same decile rank) in the same industry (Fama-French industries).

Panel D reports results using alternative proxies for tax avoidance and the control function approach to address endogeneity. The alternative proxies for tax avoidance are defined below:

AdjCashETR3 = Industry-and-size-adjusted *CashETR3*, defined as the firm's *CashETR3* minus the average *CashETR3* of firms with similar size (the same decile rank) in the same industry.

GAAP_ETR3 = Average GAAP effective tax rate over three years, calculated as the sum of a firm's income tax expense over three years divided by the sum of its total pre-tax book income (excluding special items) over the same period. Observations with a negative denominator are dropped from the analyses.

BTD3 = Average total book-tax difference over three years.

$\Delta/MVA3$ = Average of Δ/MVA over three years, where Δ is calculated as the adjusted cash taxes paid (cash taxes paid adjusted for the change in tax reserves) minus expected tax payment (pre-tax book income times the U.S. statutory tax rate), and MVA is the market value of assets (Henry and Sansing 2018).

Panel E reports results using alternative proxies for tax risk and the control function approach to address endogeneity. The alternative proxies for tax risk are defined below:

AdjSD_CashETR = Industry-and-size-adjusted *SD_CashETR*, defined as the firm's *SD_CashETR* minus the average *SD_CashETR* of firms with similar size (the same decile rank) in the same industry.

SD_GAAP_ETR = Standard deviation of annual GAAP ETR over three years.

LEAD_SETTLE3 = FIN 48 tax reserve that is settled with the tax authority from year t+1 through year t+3, divided by the ending balance of tax reserve in year t.

$SD(\Delta/MVA)$ = Standard deviation of annual Δ/MVA over three years.

Panel F reports regression results that investigate the non-linear effect of in-house tax investments on tax avoidance and tax risk using the control function approach.

See Appendix 4 for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on standard errors clustered by both firm and year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.

TABLE 9
Accounting employees and tax avoidance/tax risk

Panel A: Regression results for S&P 500 firms

	(1) *CashETR3*	(2) *SD_CashETR*
INHOUSE_TAX	-0.0159***	-0.0239**
	(-2.71)	(-2.20)
INHOUSE_ACC	0.0010	0.0002
	(1.25)	(0.47)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	2,105	2,042
Adj. R^2	0.29	0.29

Panel B: Regression results for S&P 400 firms

	(1) *CashETR3*	(2) *SD_CashETR*
INHOUSE_TAX	-0.0109**	-0.0210**
	(-2.41)	(-1.99)
INHOUSE_ACC	-0.0006	0.0015
	(-0.94)	(1.40)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	1,564	1,533
Adj. R^2	0.29	0.26

Panel C: Regression results for S&P 600 firms

	(1) *CashETR3*	(2) *SD_CashETR*
INHOUSE_TAX	-0.055**	-0.0223**
	(-2.60)	(-2.10)
INHOUSE_ACC	-0.0011*	-0.0006*
	(-1.68)	(-1.71)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	2,252	2,085
Adj. R^2	0.26	0.27

Notes: This table reports results for the effect of in-house tax employees and accounting employees on tax avoidance and tax risk, using the control function approach. The full sample includes 5,921 firm-years from S&P 1500 firms with available data over the 2009-2014 period. Panel A reports results for S&P 500 firms, panel B for S&P 400 firms, and panel C for S&P 600 firms. *INHOUSE_ACC* is the total number of accounting employees (not including tax employees) divided by the total number of employees of the firm (in thousands). See Appendix 4 for other variable definitions. The *t*-statistics (in parentheses) are based on standard errors clustered by both firm and year. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively.