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Corporate in-house human capital investment in tax planning

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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, there is little empirical evidence on how corporate in-house tax departments are associated with tax planning and compliance outcomes. Using hand-collected data on corporate tax employees in S&P1500 firms over the period 2009-2014, we find that in-house tax planning investments lead to greater tax avoidance, in-house tax compliance investments lead to lower tax risk, while general tax investments achieve both goals. We obtain the same inferences when controlling for endogeneity or using change specifications. We also find that the effects of in-house tax investments are stronger for firms without auditor-provided tax services, for firms that have under-performed their industry peers in tax planning and compliance in the past, and for tax employees with prior experiences in big N and law firms. Overall, this paper contributes to the literature by looking inside the "black box" of corporate tax departments.

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

JEL Classifications: J24, H25, H26

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1 Introduction

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

The primary reason for the limited evidence is the lack of data on in-house tax departments. We circumvent this problem by using a novel dataset of corporate tax employees for a large sample of U.S. firms. Specifically, we hand-collect information on tax employees working in S&P1500 firms over the period 2009-2014 from the employees' self-posted profiles on *LinkedIn*, the world's largest professional networking website. This data allows us to infer not only the size of a firm's in-house tax department, but also the tax employees' characteristics such as seniority, work experience, and educational background.

In-house tax departments' primary roles include tax planning and tax compliance. We

[1] Our focus is on the in-house tax department. In a cross-sectional analysis, we examine the interplay between the in-house tax department and auditor-provided tax services.
[2] Internal personnel costs include salaries and fringe benefits, while internal non-personnel costs include items such as software, record keeping, and travel.
[3] In terms of economic magnitude, Slemrod and Blumenthal (1996) estimate that the total annual cost of income tax compliance for 1,300 large corporations is $2.08 billion, or $1.57 million per firm. About 69% is related to federal tax compliance and the rest 31% is related to state tax compliance.

define tax planning broadly as activities with the objective of lowering the amount of taxes paid, and tax compliance as activities related to fulfilling the requirements of tax laws (Mills 1996).[4] Anecdotal evidence suggests that corporate tax departments play a crucial role in tax planning. For example, General Electric's (GE) tax department, well known for its size, skills, and the practice of hiring former government officials, is renowned for inventing ways to lower GE's tax bill (Fortune 2011). At the same time, prior studies suggest that corporate tax departments serve as the gatekeeper of firms' tax risk exposure; some even argue that the main focus of tax departments is tax compliance rather than tax planning (Dunbar and Phillips 2001; Donohoe, McGill, and Outslay 2014). The effect of in-house tax investments on tax planning and compliance outcomes is ultimately an empirical question.

To sharpen the empirical tests on these two key roles of in-house tax departments, we utilize the richness of *LinkedIn* data to measure tax planning and tax compliance investments. We use the idea of "tone at the top" and classify the focus of each tax department as tax planning or compliance based on the job title of the most senior tax executive. We adopt this approach because the most senior tax executive's title is likely reflective of how the executive and the tax department are evaluated, which significantly influences firms' tax decisions (Dyreng et al. 2010; Robinson et al. 2010; Law and Mills 2017).[5] If the most senior tax executive has tax planning (tax compliance) in his/her job title, we classify the tax department as tax planning (tax compliance) focus. We then measure tax planning investments as the size (i.e., the number of employees) of in-house tax departments with a tax planning focus, similarly for tax compliance investments. To control for the size effect, we

[4] As discussed in Mills (1996), tax compliance activities include bookkeeping, research, filing the tax return, examination, appeal, and litigation.
[5] For example, Robinson et al. (2010) find that when the tax department is evaluated as a profit center (as opposed to a cost center), the firm has significantly lower effective tax rate.

scale the size of the tax department by the number of employees of the firm (in thousands).[6]

For the tax departments where the most senior tax executive does not have tax planning or compliance in his/her job title, we regard the tax employees as general in-house tax investments, potentially covering both tax planning and compliance functions. In a similar fashion, we measure general tax investments as the size of such tax departments. Because the tax employees might cover both tax planning and tax compliance, it is an empirical question whether their effect is manifested in greater tax avoidance, lower tax risk, or both.

Our final sample includes 4,986 firm-years that employ 36,375 tax professionals in the income tax function over the period 2009-2014. On average, there are seven tax employees for a sample firm. The average number of tax employees varies across industries; it is the smallest for wholesale trade (5.64) and the largest for retail trade (8.27). The average number of tax employees increases during our sample period. The most common educational background is an undergraduate degree in accounting (56%), followed by a graduate degree in tax (28%) or law (13%). Many of the tax employees have worked in a Big N firm (36%) or in other corporate tax departments (14%) before taking up the current position.

In the main analyses, we examine the effects of in-house tax investments on corporate tax avoidance and tax risk. Following prior literature, we use the cash effective tax rate (cash ETR) as the main proxy for tax avoidance (Dyreng, Hanlon, and Maydew 2008), [7] and the volatility of cash ETR as the main proxy for tax risk (McGuire, Neuman, and Omer 2013; Guenther, Matsunaga, and Williams 2016). We expect tax planning investments to be associated with greater tax avoidance and thus lower cash ETR. Similarly, we expect tax compliance investments to be associated with lower tax risk and thus lower volatility of cash

[6] In sensitivity tests, we use alternative measures of tax investments, including the logarithm of the total number of tax employees and the estimated total salary of tax employees, and obtain similar inferences.
[7] Following Hanlon and Heitzman (2010) and Graham, Hanlon, Shevlin, and Shroff (2014), tax avoidance is defined "broadly as the reduction in explicit cash taxes, which includes all transactions from investing in a municipal bond to engaging in tax shelters."

ETR. We do not make ex-ante predictions on the effect of general tax investments on tax avoidance and tax risk.

Because certain firm characteristics, such as tax saving opportunities, might affect both tax investments and tax outcomes, we use two design choices to address the endogeneity concern. First, we include a comprehensive list of variables that prior research suggests affect tax outcomes. Second, we use an instrumental variable (IV)—the number of graduate tax programs in 2004 in the state of the firm's headquarter and the control function approach to explicitly address endogeneity.[8,9] We believe that these two design choices together largely address the potential endogeneity of in-house tax investments. Following Larker and Rustics (2010), we also report the OLS results without controlling for endogeneity to ensure that our results are robust. In addition, to further establish the causality, we take advantage of the over-time variation in in-house tax investments and conduct change analyses.

Consistent with our predictions, we find that firms with more tax planning investments exhibit greater tax avoidance, after controlling for industry fixed effects and various firm characteristics that might affect firms' tax rate. We find that general tax investments also lead to greater tax avoidance, while tax compliance investments are not associated with tax avoidance. As for tax risk, we document a significant and negative association between tax compliance investments and tax risk. We find that general tax investments also lead to lower tax risk. Together, our tests indicate that tax planning investments primarily increase tax avoidance and tax compliance investments primarily reduce tax risk, while general tax investments achieve both goals.

[8] Please see Wooldridge (2015) for a detailed discussion of the control function approach. Specifically, we first estimate a prediction model for the size of in-house department using IV and control variables. We then include the residuals from the prediction model in the regressions explaining tax outcomes. Please see Section 3 for details.

[9] 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.

The change analyses lead to the same inferences. We find a negative association between the change in tax planning or general tax investments and one-year-ahead change in tax rate. Similarly, we find a negative association between the change in tax compliance or general tax investments and one-year-ahead change in tax risk. In addition, when we separate increases from decreases in tax investments, we find that the change analysis results are driven by increases in tax investments. That is, adding tax professionals can improve the effectiveness of tax planning and compliance, while cutting tax professionals does not appear to hurt tax planning and compliance in the short-term.

We conduct two sets of cross-sectional analyses to provide additional insights. First, firms rely on both internal tax departments and external service providers for tax planning and compliance. Due to data limitation, there is little research on the interplay between these two. Using the tax fees paid to the firm's auditor as a proxy for the use of auditor-provided tax services (e.g., Klassen, Lisowsky, and Mescall 2016a), we find that the effect of in-house tax investments is lower for firms that also use auditor-provided tax services. This result suggests that in-house tax investments and auditor-provided tax services appear to be substitutes. Second, we find that the impact of the change in in-house tax investments is more pronounced for firms that have under-performed their industry peers in the past in tax planning or compliance. This result suggests that in-house tax investments are especially effective if the firm has not done well in tax planning or compliance (Brown 2011; Brown and Drake 2014; Kubick, Lynch, Mayberry, and Omer 2015; Armstrong et al. 2016).

Lastly, we conduct a series of additional analyses to enrich the findings and to check the robustness of the results. First, we combine tax planning, tax compliance, and general tax investments into an overall measure of internal tax investments. We find that the overall internal tax investments lead to more tax avoidance and lower tax risk. Second, we find that prior experience of tax employees matters in the effectiveness of tax planning and

compliance: compared with other tax employees, those with prior work experience in Big N, other CPA firms, and law firms have a greater impact on the effectiveness of tax planning and tax compliance. Third, our results are robust to the inclusion of additional control variables (e.g., advertising expenditures and minority interests' earnings) and to the use of the IV approach in addressing endogeneity. Fourth, our results are robust to alternative proxies for tax avoidance and tax risk, including the level and standard deviation of industry-size-adjusted cash ETR (Balakrishnan, Blouin, and Guay 2012), and the level and standard deviation of GAAP ETR (Dyreng, Hanlon, and Maydew 2010; Armstrong, Blouin, and Larcker 2012; Graham, Hanlon, Shevlin, and Shroff 2014).

This study contributes to the literature in several important ways. First, previous studies have investigated the link between external tax services and tax planning (e.g., McGuire, Omer, Wang 2012; Dhaliwal, Gal-Or, Naiker, and Sharma 2013). However, there is limited research on the implications of in-house tax spending because of the "difficulties in quantifying firms' input in tax planning due to limited archival data (Klassen et al. 2016a)." Our study overcomes this limitation by using detailed archival data on corporate tax departments (size, focus, and composition) to provide a comprehensive analysis of the effect of in-house tax investments on both tax avoidance and tax risk.

Second, our findings contribute to the understanding of the cross-sectional determinants of tax avoidance and tax risk. Shackelford and Shevlin (2001) emphasize that it is critical to understand the organizational factors that affect tax avoidance. Several recent studies provide archival and survey evidence on the influence of factors such as the ownership structure, the performance measurement of corporate tax departments, and the compensation structure of business unit managers, tax directors, and executives.[10] Our study contributes to this stream

[10] For examples, see Phillips (2003), Chen, Chen, Cheng, and Shevlin (2010), Robinson et al. (2010), Armstrong et al. (2012), Rego and Wilson (2012), Gaertner (2014), and Powers, Robinson, and Stomberg (2016).

of literature by demonstrating the importance of in-house tax departments, a direct input in corporate tax planning and compliance, and by further investigating the impact of the focus and experience of in-house tax departments.

Our study is closely related to, but greatly extends Mills et al. (1998). Mills et al. (1998) provide early evidence on the negative association between total tax investments and ETR using survey data from 365 firms in 1992, although they do not find a significant impact of internal tax investments on ETR. We extend their study in several important ways. First, we examine a much larger sample (S&P1500 firms) in a more recent period (2009-2014). Since early 1990's, the corporate tax landscape has changed dramatically, with growing regulatory pressures and more stringent and complex reporting requirements (e.g., Maydew and Shackelford 2007; Deloitte 2013; Dyreng, Hanlon, Maydew, and Thornock 2016). Internal tax departments of public firms have also transformed, to a profit-enhancing division for some and a risk management center for others (Donohoe, McGill, and Outslay 2014). Given the changing landscape and the transformation of internal tax departments, it is important to examine whether internal tax departments continue to play significant roles in tax planning. Second, while our tests of tax avoidance re-affirm the importance of internal tax investments in tax planning, we provide new evidence on the role of internal tax departments in managing tax risk.[11] Third, we provide fresh insights into the cross-sectional variation in the effectiveness of internal tax investments depending on auditor-provided tax services, past tax performance, and work experiences of tax employees. Lastly, our evidence, based on a much larger and more representative sample, is also more generalizable. We discuss the differences

[11] Examining both tax avoidance and tax risk is important because practitioners emphasize that tax savings and tax risk management are key objectives (Deloitte 2013), and there can be a trade-off between the two tasks. Aggressive tax transactions may be questioned by IRS about economic purposes and increase risk of IRS audit and challenge, which can increase the volatility of tax rates because of tax adjustments and penalties, etc. (Bauer and Klassen 2014; Saavedra 2015). Practitioners also recognize this trade-off. For instance, in the setting of transfer pricing, Klassen, Lisowsky, and Mescall (2016b) find that most of firms choose one of the following two as the goal: "cash tax paid" versus "lack of disputes with tax authorities." Only a small proportion of firms choose both as goals.

between our paper and Mills et al. (1998) in more detail in the next section.

We conclude the introduction with a couple of caveats. First, our analyses focus on the benefits of having a large in-house tax department—reducing tax rate and tax risk. We do not consider the associated costs or the costs of tax planning such as reputational costs (e.g., Gallemore, Maydew, and Thornock 2014; Dyreng, Hoopes, and Wilde 2016). As such, our analyses cannot be used to infer the optimality of the in-house tax department size. Second, like many empirical studies on tax avoidance, we do not consider implicit taxes. Our findings only illustrate the implications of corporate tax departments for explicit taxes.

The reminder of this paper is organized as follows. Section 2 discusses the related literature and 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 Literature Review and Hypothesis Development

2.1 Related Prior Research

Firms engage in various tax planning activities to reduce their tax liabilities (Shackelford and Shevlin 2001; Hanlon and Heitzman 2010). Tax planning activities range from simple planning such as the use of tax-favored municipal bond investments, to cross-border tax strategies involving multi-state or foreign tax planning, to more aggressive strategies such as the use of tax shelters (e.g., Dyreng and Lindsey 2009; Lisowsky 2010; Brown 2011; Klassen and Laplante 2012; Dyreng, Lindsey, and Thornock 2013; Lisowsky, Robinson, and Schmidt 2013).[12]

While saving taxes is beneficial to firms, reducing tax risk and maintaining stable tax

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

rates are also important objectives. Recent studies suggest that the volatility of tax rates is detrimental to firms. For example, the volatility of cash ETR is positively associated with the likelihood of unfavorable tax settlement and the volatility of future stock returns, and negatively associated with earnings persistence (McGuire et al. 2013; Bauer and Klassen 2014; Guenther et al. 2016). Firms with higher cash ETR volatility also have higher loan spreads and more restrictive loan contracting terms (Hasan et al. 2015; Saavedra 2015).

It thus follows that firms have incentives to improve tax planning and compliance effectiveness in order to reduce the level and volatility of tax rates. Despite the importance of reducing tax rate and risk, it is not well understood why some firms are more effective in tax planning and compliance than others. One reason that is often cited in the press is the complexity of tax codes and the associated high planning and compliance costs. Firms might forgo tax planning opportunities because of tax complexity (McKinnon 2012). This is especially true for small- and medium-sized firms due to their limited resources. Large firms have also raised concerns with tax compliance costs. In a hearing before the U.S. House of Representatives, Mark Schichtel, Senior Vice President and Chief Tax Officer for Time Warner Cable, expressed the frustration that "we have to spend so much just to comply with the law, not even optimizing, I am just talking [about] basic compliance… I can't imagine what it is like for companies that don't have the kind of resources that we have (U.S. House of Representatives 2013)." In her response to Mark Schichtel's comment, Professor Michelle Hanlon pointed out that small firms have a very hard time with tax complexity because they may not even have an internal tax department. A recent survey finds that tax professionals cite "insufficient resources to cover tax function activities" (75% of respondents) and "insufficient internal communication" (64%) as the two major potential causes for tax risk (Ernst and Young 2014).

These discussions suggest that in the presence of tax complexity, investing in firms'

internal tax departments can greatly improve tax planning and compliance effectiveness.

However, there is little empirical research on firms' in-house tax departments due to the lack of archival data. One notable exception is Mills et al. (1998). Using survey data of 365 firms in 1992, Mills et al. (1998) find that firms' *total* tax spending increases with foreign operations, capital intensity, and the number of legal entities, and decreases with firm size, consistent with tax investments varying with tax complexity and economy of scale. More relevant to our study, the authors find that a firm's ETR is negatively correlated with its *total* tax spending. Our study extends Mills et al. in several important dimensions. First, our research question extends Mills et al.'s. We examine the impact of in-house tax investments on both tax avoidance and tax risk. Examining both tax avoidance and tax risk broadens the research scope and provides a more comprehensive picture of the role played by in-house tax departments. This is important given the potential conflicts between tax avoidance and tax risk management. The conflicts arise because, as discussed earlier, firms may face resource constraints and aggressive tax transactions can attract IRS audit and challenges and increase tax risk. In addition, we use the job title of the most senior tax executive to identify whether in-house tax departments represent firms' tax planning- or compliance-focused investments, or general investments without a specific focus. Thus, our analysis is more refined – we examine whether tax planning and compliance investments achieve their respective objectives and whether general tax investments help with tax planning, compliance, or both.

Second, Mills et al. (1998) document that while total tax spending is significantly negatively correlated with the effective tax rate, internal tax spending is not significantly correlated with the effective tax rate, despite the negative association. This is potentially due to the small sample size. In contrast, we document a robust negative association between our measure of in-house tax investments and the effective tax rate.

Third, we focus on the most recent period. The survey data used by Mills et al. is

collected in 1992 and our sample period is 2009-2014. Over the last two decades, the landscape of corporate tax has changed drastically. Regulatory pressures have grown and more stringent and onerous reporting requirements have been imposed on firms (Deloitte 2013). Responding to the changes in regulatory requirements and business environments, internal tax departments of public firms have undergone transformations, to a profit-enhancing department for some and a risk management center for others (Donohoe, McGill, and Outslay 2014). Thus, it is important to re-examine the role of internal tax departments in the increasingly complex regulatory environment (Maydew and Shackelford 2007; Dyreng, Hanlon, Maydew, and Thornock 2016).

Fourth, our sample is significantly larger than Mills et al.'s. Mills et al.'s analysis is based on survey data from 365 firms, while our tests are based on panel data from S&P 1500 firms. A larger and more representative sample increases the generalizability of the inferences. Because of the small sample size, Mills et al. (1998) warn readers that their results might not be generalizable to other firms. In addition, the survey data is likely subject to sample selection issues, further restricting the generalizability of their results. Using the same survey data, Slemrod and Blumenthal (1996) acknowledge that "although large firms dominate the sample, it does not represent the top 500, 1000, or 5000 companies in the U.S. (page 5)."

Our study is also related to, but differs from, several studies on the role of external tax services in firms' tax avoidance. For example, McGuire et al. (2012) find that audit firms with tax-specific industry expertise can help their clients to achieve significant tax savings. Dhaliwal et al. (2013) document a positive association between tax service fees paid to the auditor and the client firm's tax avoidance. They further find that the association is stronger for the client firms that obtain both tax planning and tax compliance services from the auditor, consistent with a knowledge spillover effect. Different from these studies, our focus

is on the implication of *in-house* tax investments for tax planning and compliance, on which there is limited evidence.

Lastly, our study is also related to a recent study by Klassen et al. (2016a), who examine the association between the party signing the tax returns and unrecognized tax benefits (UTB) using confidential data from the IRS. They find that firms preparing their own tax returns or hiring non-auditor tax preparers report higher UTB than those hiring their auditors as tax preparers. The findings are consistent with internal and external non-auditor tax preparers taking more tax aggressive positions than auditor tax preparers. Klassen et al. and our study address different research questions. While Klassen et al. compare the effect of different types of tax preparers on tax aggressiveness, we investigate the effect of in-house tax investments on both tax avoidance and tax risk.

To the extent that UTB also captures tax risk, Klassen et al.'s findings indicate that firms with internal tax preparers are associated with higher tax risk than those with auditor tax preparers, while our findings suggest that greater in-house tax investments lead to lower tax risk. Note that these two results are not contradictory. While auditors can reduce tax risk when hired as tax preparers, we find that ceteris paribus, for a given firm, investing more in internal tax departments leads to incrementally lower tax risk. The role of auditor-provided tax services and additional internal tax employees in reducing tax risk can co-exist. This is indeed what we find when we examine both auditor-provided tax services and internal tax investments in the tax risk analysis.[13]

2.2 Association between In-House Tax Investments and Tax Avoidance, Tax Risk

A well-staffed in-house tax department can facilitate a firm's tax avoidance through channels such as the identification of tax saving opportunities, coordination and information

[13] Unfortunately, due to the proprietary nature of the data used in Klassen et al. (2016a), we cannot check the correlation between our internal tax investment measure and Klassen et al.'s indicator for internally-signed tax returns.

sharing with other units of the firm, and in-depth knowledge to transform opportunities into actual tax savings.[14] Prior studies provide supportive evidence that such factors can facilitate tax avoidance. For example, De Simone, Ege, and Stomberg (2015) and Bauer (2016) document that resource constraints such as an insufficient number of personnel with adequate tax knowledge lead to a greater number of tax-related internal control material weaknesses. Bauer (2016) further documents that tax-related material weaknesses negatively affect firms' ability to reduce taxes, resulting in higher cash and GAAP ETR. Lynch (2014) also finds that the remediation of tax-related material weaknesses, either through hiring outside consultants or recruiting internal personnel, increases firms' future tax avoidance. Gallemore and Labro (2015) argue that information sharing and coordination across divisions within a firm are important for effective tax planning, and find that firms with better internal information quality have lower cash ETR.

At the same time, a key role played by in-house tax departments is to provide high-quality tax compliance work and serve as the gate keeper of a firm's tax risk exposure. For example, Dunbar and Phillips (2001) and Donohoe et al. (2014) suggest that in-house tax departments focus primarily on tax compliance. Other studies also suggest that firms may be more inclined to rely on outside experts for tax planning, if certain tax strategies are difficult to implement in-house and outside tax experts gather expertise from serving a large number of clients (Wilson 2009; Lisowsky 2010; Brown 2011; McGuire et al. 2012; Lisowsky et al. 2013). A survey by the Tax Executives Institute of 500 chief tax officers around the world reports that the top three measures used to evaluate a corporate tax department's performance are "lack of surprises" (72%), "the results of audits" (60%), and "meeting compliance

[14] With respect to the strategy the in-house tax team uses for tax planning, as discussed earlier, it can be simple planning such as the use of tax-favored investments, or more complex strategy such as transfer pricing or the use of tax shelters. For example, Xilinx Inc., the winner of "America's Best In-house Tax Team" award in 2010, saved more than $40 million in taxes through transfer pricing, by not allocating employee stock option expenses to its Irish subsidiary. IRS challenged Xilinx's decisions but the tax disputes were resolved in Xilinx's favor.

deadlines" (59%) (TEI 2012).[15] In an interview with the CFO Magazine, Mark Mendola, the U.S. tax leader of a Big 4 accounting firm, pointed out that in-house tax departments traditionally focus on identifying, analyzing, and mitigating tax risk (Mendola 2014). Accordingly, firms with more in-house tax employees focusing on tax compliance will be more effective in the compliance work such as research, examination, and documentation to fulfill the tax law requirements. With more effective documentation and research, these firms will possess stronger supporting facts regarding their tax positions and are able to sustain the tax positions over time, reducing tax risk.

Given the above discussions on the dual roles of in-house tax departments, a larger in-house tax department means more resources devoted to tax planning and/or higher amount of tax compliance work. To make clear predictions, we make use of the richness of *Linkedin* data and classify internal tax investments into tax planning investments, tax compliance investments, and general tax investments based on the focus of the tax departments. Our discussions suggest that more tax planning investments and more tax compliance investments will lead to more effectiveness in tax planning and compliance, respectively. Our hypotheses are thus stated as (in alternative form):

H1: *Firms' in-house tax planning investments are positively associated with tax avoidance.*

H2: *Firms' in-house tax compliance investments are negatively associated with tax risk.*

With respect to general tax investments, it is an empirical question whether general tax investments lead to more tax avoidance, lower tax risk, or both. Hence, we do not make an ex-ante prediction.

Finally, while H1 links tax planning investments to tax avoidance and H2 links tax

[15] Tax planning outcomes "cash taxes" (57%) and "effective tax rates" (53%) rank fourth and fifth, respectively, among the most common performance measures. An earlier survey by Ernst and Young documented a similar finding that "tax risk management" is a more important performance measure for tax directors than "cash flow impact" or "effective tax rate" (Ernst and Young 2004).

compliance investments to tax risk, a natural question is whether tax planning investments affect tax risk and tax compliance investments affect tax avoidance. Because of potential conflicts between tax avoidance and tax risk management (Neuman et al. 2013: Graham et al. 2014), tax planning investments may lead to higher tax risk and tax compliance investments may lead to higher tax rate. Thus, in the regressions, we include tax planning investments, tax compliance investments, and general tax investments at the same time in order to also capture the effect of tax planning investments on tax risk and the effect of tax compliance investments on tax avoidance, if any.

2.3 Cross-sectional Predictions

In cross-sectional analyses, we examine whether the effectiveness of a firm's in-house tax departments in tax planning and compliance varies systemically with (i) the firm's use of auditor-provided tax services and (ii) the firm's prior tax planning and compliance performance relative to its industry peers.

First, other than the in-house tax team, a firm can also seek external tax services, including those provided by its auditor. Prior research finds that auditor-provided tax services help firms to realize greater tax savings (McGuire et al. 2012; Dhaliwal et al. 2013; Klassen et al. 2016a) and improve tax-related internal control quality (De Simone, Ege, and Stomberg 2015). Given that both in-house tax departments and auditors can reduce tax rate and tax risk, the impact of in-house tax departments on tax planning and compliance outcomes will be lower when the auditor provides tax services. Thus, our third hypothesis is:

> ***H3:*** *The impact of firms' in-house tax investments on tax avoidance and risk, as hypothesized in H1 and H2, is lower for firms using auditor-provided tax services.*

At the same time, in-house tax departments and auditors might also complement each other in tax planning and compliance. For instance, the two teams' knowledge and skills can be

complementary and they can cooperate. In that case, the findings will be opposite to what is hypothesized in H3.[16]

Second, firms differ in the effectiveness of tax planning and compliance. Prior research finds that firms can learn from their peers and mimic tax planning strategies of industry leaders (Brown 2011; Brown and Drake 2014; Kubick et al. 2015). If a firm is less effective in tax planning and compliance than peers, i.e., having higher tax rate or risk, it can catch up by hiring more tax professionals (Armstrong et al. 2016). One important reason for a firm to recruit tax professionals is to improve tax planning and compliance effectiveness when the firm has been under-performing compared to its peers. For such under-performing firms, we expect to find a stronger effect of new tax employee hires on the firms' tax outcomes. Thus, our last hypothesis is:

> ***H4:*** *The impact of the change in firms' in-house tax investments on tax avoidance and risk is larger for firms with higher tax rate and risk relative to industry peers.*

Alternatively, one can argue that the effectiveness of tax planning and compliance reflects the firm's intention and ability in saving taxes and managing tax risk. Thus, one can arrive at the opposite prediction that the effect of the change in in-house tax investments will have a larger effect for firms that have been more effective in tax planning and compliance, i.e., those with lower tax rate and risk.

3 Data and Research Design

3.1 Sample and Data

We obtain data 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

[16] Note that a limitation of this analysis is that 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.

other firms, we select the non-financial S&P 1500 companies in 2014 as our sample firms.

For each sample firm that has a *LinkedIn* company page, 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 those 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 period 2009-2014, containing year, firm, and individual tax employee' information. For individual employees, we collect information on their job title in the year, educational background, and prior work experience. Appendix A describes the data collection in more detail.

An important concern related to *LinkedIn* data is the comprehensiveness of the coverage of tax employees, i.e., whether the majority of the tax employees in our sample firms have a *LinkedIn* account. We believe that the *LinkedIn* coverage is fairly comprehensive. A study by BrightEdge, a marketing firm, concludes that "9 out of the top 10 brands with the most followers on *LinkedIn* have at least 60% of their employees on *LinkedIn*." The percentage could be higher for tax professionals. For our sample of S&P1500 firms, the average number of tax employees (in the income tax function) is 7. If the sample is restricted to S&P500 firms, the average number of tax employees is 11. This number is comparable to the statistics from a recent survey of 500 chief tax officers around the world, which reports an average of 10.6 tax employees for the largest companies from U.S., Canada, Europe, and Asia (TEI 2012). While we believe that the *LinkedIn* data coverage is comprehensive, 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.[17]

Using individual employees' work history to construct the tax departments in the past is

[17] Another concern is that the likelihood of tax employees having *LinkedIn* accounts might vary across industries or over time. To address this concern, we include industry and year fixed effects in all regressions.

subject to a couple of limitations. Some 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 the past work experience. These limitations can lead to a downward bias in the estimation of the tax department size in the earlier years. To alleviate the impact of this downward bias, as mentioned above, we use year 2009 as the start of our sample period; using a different starting year leads to similar inferences.

We collect financial data from COMPUSTAT. The final sample consists of 4,986 firm-years, covering 36,375 individual-years, over the period 2009-2014. The sample used for various regressions can be smaller due to additional data requirements.

3.2 In-house Tax Investments

We measure a firm's overall in-house tax investments by the size of its in-house tax department, calculated as the total number of in-house tax employees (*TAX_TOTAL*). This measure captures whether the firm has a sufficient number of personnel with adequate tax knowledge. Since the total number of in-house tax employees (*TAX_TOTAL*) is positively correlated with firm size, we use a scaled measure, *INHOUSE_TAX*, in the regressions to control for the size effect.[18] *INHOUSE_TAX* is measured as the number of tax employees divided by the firm's total number of employees (in thousands).

Panel A of Table 1 presents the descriptive statistics of *TAX_TOTAL* and *INHOUSE_TAX*. The average number of tax employees in a tax department is 7.3. The distribution is right skewed; the median is 4.0. *INHOUSE_TAX* has a mean of 0.84, implying that on average about 0.084% of a firm's employees work in the income tax function.

Panel B presents the descriptive statistics by firm size, industry, and year. As expected, the number of tax employees (*TAX_TOTAL*) increases with firm size, but the scaled measure (*INHOUSE_TAX*) decreases with firm size, reflecting the economy of scale in the tax

[18] The Pearson correlation between *TAX_TOTAL* and total assets is 0.554 and that between *TAX_TOTAL* and total number of employees is 0.577.

function. The number of tax employees is mostly similar across industries; it is smallest for wholesale trade (5.64) and largest for retail trade (8.27). The scaled measure shows a large variation across industries; it is smallest for retail trade (0.30) and largest for mining (1.42). Therefore, it is important to control for industry fixed effects in the regressions. Over time, the number of tax employees increase steadily, while the scaled measure is similar across years except for the last year (2014) when the sample size is small.[19] The similar average of *INHOUSE_TAX* across the years indicates that the potential downward bias in the estimation of the tax department size in the earlier years due to back-filling the data, as discussed above, is not a major concern.

Panel C presents the characteristics of tax employees. Of the 36,375 employee-years in our sample, 9,223 are at the executive level, 15,555 are at the manager level, and 11,597 are at the analyst level. About 56% of the tax employees have an undergraduate degree in accounting. More than half of the tax employees also have a graduate degree in related fields: 28% in tax, 13% in law, and 31% in business (other than tax and law). About 24% of the tax employees have a CPA. In terms of work experience, 36% have worked in Big N (including 1% at the partner level and 16% at the manager level), 5% in non-Big N accounting or tax consulting firms, 7% in law firms, 3% in financial institutions, 2% in the IRS or Treasury, and 14% in other corporate tax departments (at the manager level or above).

3.3 Tax Planning Investments, Tax Compliance Investments, and General Tax Investments

Prior research suggests that top executives have significant influence over a firm's tax decisions (Dyreng et al. 2010; Law and Mills 2017). Consistent with prior literature, we use the idea of "tone at the top" to capture the focus of in-house tax departments. The most senior tax executive's job title likely reflects how he/she and the tax department are evaluated and

[19] The sample size is much smaller in 2014 than in the other years because the main measures of tax avoidance and tax risk are based on three years' data (centered on the current year). Thus we need 2015 financial data in order to calculate the tax measures for 2014. At the time of data collection, many sample firms' 2015 financial data is not yet available.

how the tax resources are allocated. Thus, for each tax department, we identify *the most senior* tax executive, who usually holds the title of Chief Tax Officer, VP Tax, Tax Director, or Head of Tax.[20] If this individual's job title has the word "planning," we regard this tax department's main focus as tax planning. If this individual's job title has the word "compliance," we regard this tax department's main focus as tax compliance. Lastly, if this individual's job title does not have the word "planning" or "compliance," we assume that this tax department's employees represent general tax investments, potentially covering both tax planning and compliance.

We then construct three variables. Tax planning investments, *INHOUSE_TAX_PLANNING*, are set as *INHOUSE_TAX* for tax departments focusing on tax planning and zero for the other departments. Tax compliance investments, *INHOUSE_TAX_COMPLIANCE*, are set as *INHOUSE_TAX* for tax departments focusing on tax compliance and zero for the other departments. General tax investments, *INHOUSE_TAX_GENERAL*, are set as *INHOUSE_TAX* for tax departments without a specific focus on tax planning or compliance, and zero for the other departments. The sum of these three variables is the overall tax investments, *INHOUSE_TAX*.

As reported in Panel A of Table 2, the means of the three components of tax investments (*INHOUSE_TAX_PLANNING*, *INHOUSE_TAX_COMPLIANCE*, and *INHOUSE_TAX_GENERAL*) are 0.063, 0.071, and 0.71, respectively.[21]

We also consider an alternative classification scheme. We classify a tax department as tax planning focus (tax compliance focus) if *at least one* tax executive's job title contains the

[20] For tax departments with multiple executives of similar titles, we use professional prefixes such as "Head" or "Senior" to identify the most senior executive.

[21] For the sample of 4,400 firm-years with non-zero tax employees, 405 firm-years (9.2%) are classified as tax planning focus, 418 firm-years (9.5%) as tax compliance focus, and the rest as having no specific focus. Untabulated analyses indicate that compared to other firms, firms with tax planning or tax compliance focus are larger, are more complex, have more intangible assets and fewer fixed assets, and are more likely to use auditors for tax services. We leave it to future research to study why there are such differences.

word “planning” (“compliance”). For tax departments that have tax executives with both types of titles, we classify the tax department as both tax planning and tax compliance focus. Untabulated analyses based on this alternative method lead to the same inferences.[22]

3.4 Tax Avoidance and Tax Risk Proxies

We define tax avoidance as the reduction in explicit taxes (Hanlon and Heitzman 2010). Our main proxy for tax avoidance is cash ETR. To mitigate the measurement issues of a 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*–1, *t*, and *t*+1), 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., McGuire et al. 2013; Guenther et al. 2016), 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*–1, *t*, and *t*+1). We choose this measure because previous studies show that cash ETR volatility has significantly negative tax outcome and capital market implications and is significantly associated with the overall firm risk (Bauer and Klassen 2014; Hasan et al. 2015; Saavedra 2015; Guenther et al. 2016).

Panel A of Table 2 reports the descriptive statistics on tax avoidance and risk proxies. The sample firms have a mean *CashETR3* of 25% and a mean *SD_CashETR* of 10%.[23] These statistics are comparable to those reported previously (e.g., Dyreng et al. 2008; McGuire et al. 2013; De Simone, Mills, and Stomberg 2015; Gallemore and Labro 2015; Guenther at al. 2016).

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[22] Alternatively, we can count the number of tax employees with job title containing the word “planning,” “compliance,” or neither, to capture tax planning investments, tax compliance investments, and general investments. However, the problem with this approach is that it ignores the “tone at the top” and does not reflect the greater importance of higher ranked tax employees. We use a weighted approach instead, by assigning different weights to tax executive, tax managers, and tax analysts. The analyses based on this approach yield similar inferences.

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

In sensitivity tests, we use alternative proxies for tax avoidance and tax risk to ensure the robustness of our results.

3.5 Regression Specifications

To test our hypotheses, we estimate the following equation:

$$\begin{aligned} \textit{Tax Avoidance or Tax Risk} = {} & \beta_0 + \beta_1\, \textit{INHOUSE\_TAX\_PLANNING} \\ & + \beta_2\, \textit{INHOUSE\_TAX\_COMPLIANCE} \\ & + \beta_3\, \textit{INHOUSE\_TAX\_GENERAL} \\ & + \gamma\, \textit{Controls} + \textit{Industry Fixed Effects} + \textit{Year Fixed Effects} + \varepsilon \end{aligned} \tag{1}$$

The independent variables of interest are *INHOUSE_TAX_PLANNING*, *INHOUSE_TAX_COMPLIANCE*, and *INHOUSE_TAX_GENERAL*. Following prior research, we include a number of firm characteristics associated with tax planning opportunities or tax outcomes (e.g., Dyreng et al. 2008; Robinson et al. 2010; Gallemore and Labro 2015; Klassen et al. 2016a, b). 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 activities (*R&D*), intangibles (*INTANG*), inventory intensity (*INVENTORY*), an indicator for loss carrying forward (*NOL*), change in loss carrying forward (Δ*NOL*), an indicator for foreign operations (*FOR_DUMMY*), income from foreign operations (*FOR_INCOME*), the number of business segments (*LN_SEGMENTS*), the number of material subsidiaries in tax haven jurisdictions (*LN_HAVENS*), the presence of internal control weakness (*ICW_DUMMY*), an indicator for the use of auditor-provided tax services (*TAXFEES_DUMMY*), as well as industry and year fixed effects. Following De Simone, Ege, and Stomberg (2015) and Guenther et al. (2016), we further include the level of tax avoidance (*CashETR3*) and the volatility of pre-tax book income (*SD_PI*) in the tax risk regression to control for their effects on the volatility of cash ETR. To be consistent with the measures of tax avoidance and tax risk, we measure the control variables using three-year

average over the same period.[24] Appendix B describes variable measurements. Tax rates are winsorized at 0 and 1, and all other continuous regression variables are winsorized at the 1% and 99% percentiles.

An important concern is that in-house tax investments are likely endogenously determined. It is possible that the size of a firm's in-house tax department is affected by firm characteristics that determine the amount of tax planning and compliance work desired by the firm (e.g., Mills et al. 1998; Klassen et al. 2016a). These characteristics might affect tax avoidance and risk as well. If they are not controlled for, the correlated omitted variable problem arises and the ordinary least squares (OLS) estimations may be biased.

To address this concern, we include a comprehensive list of control variables in the above regression. In addition, we use the control function approach to explicitly address endogeneity (Wooldridge 2010, 2015). Specifically, we add to Equation (1) the residuals from the following determinant model of *INHOUSE_TAX*:

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

The instrumental variable (IV) in Equation (2) is *TAX_EDUCATION*, which is measured as the number of graduate tax programs in 2004 in the state of the firm's headquarter. We hand-collect the number of graduate tax programs (including law programs and accounting programs with a taxation concentration) in each state. This variable satisfies the relevance criteria because the size of a firm's in-house tax department is affected by its access to tax professionals, which is in turn affected by the number of graduate tax programs in the firm's headquarter state.[25] This variable also satisfies the exclusion criteria because

[24] Note that in-house tax investments (*INHOUSE_TAX_PLANNING*, *INHOUSE_TAX_COMPLIANCE*, *INHOUSE_TAX_GENERAL*) are annual measures. Using three-year average leads to the same inferences.

[25] To substantiate this statement, we examine tax professionals working for companies with headquarters in two 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

TAX_EDUCATION is unlikely to be affected by individual firms' tax outcomes five to ten years later. In fact, many of the graduate tax programs were established well before 2004. In Equation (2), in addition to the IV, we include the control variables from Equation (1).

The main benefit of using the control function approach to address endogeneity is its simplicity. This is particularly advantageous in our setting because in-house tax investments are partitioned into three components (i.e., planning, compliance, and general). Under the control function approach, there is no need to find an instrument for each term; the control function approach controls for the endogeneity of *INHOUSE_TAX*, including its partitions and interaction terms. Compared to the commonly used instrumental variable (IV) approach, the drawback of the control function approach is that it requires stronger assumptions. Hence, we use the IV approach in a robustness check reported later.

Appendix C presents the results for the determinant model. The coefficient on *TAX_EDUCATION* is significantly positive (t = 4.34), consistent with our argument that it is easier for firms headquartered in states with a greater number of tax programs to recruit tax employees. The partial F-statistic (untabulated) is 18.8, greater than the critical value of 8.96 for one instrument (Larcker and Rusticus 2010), indicating that our analyses are not subject to the weak instrument problem. With respect to other variables, we find that in-house tax department size decreases with firm size, consistent with economy of scale in tax investments (Mills et al. 1998; Rego 2003; Slemrod and Venkatesh 2002). Firms with higher market-to-book ratio, greater amounts of fixed assets, intangible assets, inventory, and more tax haven subsidiaries also have a smaller tax department. Finally, the coefficients on ROA, leverage, the auditor tax fee dummy are significantly positive, indicating that profitable firms, firms

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in our sample, 48 (36%) obtained their tax or law degrees from Texas. These percentages are much higher than the percentage of tax and law graduate programs 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.

with higher leverage, and firms that use auditor-provided tax services hire more in-house tax employees. The adjusted R-squared of the model is 0.38.

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

4 Empirical Results

4.1 Descriptive Statistics

Panel A of Table 2 presents descriptive statistics on the regression variables. On average, the sample firms have total assets of 10,883 million, *ROA* of 9%, the market-to-book ratio of 3.05, leverage of 20% (of total assets), *PPE* of 29% (of total assets), *R&D* of 3% (of total assets), intangible assets of 24% (of total assets), inventory of 7% (of total assets), foreign income of 3% (of total assets), 8.36 business segments, and 8.88 material subsidiaries in tax havens. Of the sample firms, 52% have loss carry forward, 62% have positive foreign income, 2% report internal control material weaknesses, and 83% use tax services provided by their auditors. The mean standard deviation of pre-tax book income (deflated by total assets) is about 4%. On average, there are about eight graduate tax programs in the firm's headquarter state.

Panel B of Table 2 presents the Pearson correlations between in-house tax investment variables and tax avoidance and risk proxies. *CashETR3* and *SD_CashETR* are positively correlated; this positive association is likely mechanical as the standard deviation of a variable with higher value tends to be higher as well. *INHOUSE_TAX* (the overall measure), *INHOUSE_TAX_PLANNING*, and *INHOUSE_TAX_GENERAL* are all negatively correlated

with *CashETR3.* Both *INHOUSE_TAX* and *INHOUSE_TAX_GENERAL* are positively correlated with *SD_CashETR. INHOUSE_TAX* is positively correlated with its three components.

Panel C of Table 2 presents the Pearson correlations among the control variables. Most of the correlations are small, except that *LN_HAVENS* is highly correlated with *FOR_DUMMY* (0.44), *FOR_INCOME* (0.46), and *LN_SEGMENTS* (0.43). *FOR_DUMMY* is also highly correlated with *FOR_INCOME* (0.53) and *LN_SEGMENTS* (0.45). These high correlation coefficients are not surprising as the variables capture similar aspects of the operations. *PPE* and *INTANG* are highly negative correlated (–0.43). Testing for multicollinearity using variance inflation factors indicates that multicollinearity is not a major issue in the regressions.

4.2 In-house Tax Planning Investments and Tax Avoidance: Test of H1

Table 3 presents the test of H1. We report the results using both the control function approach (Column (1)) and the OLS regression (Column (2)). H1 implies that in-house tax planning investments (*INHOUSE_TAX_PLANNING*) have a positive impact on tax avoidance, i.e., a negative impact on tax rate.

We focus our discussions on the results using the control function approach since it addresses the potential endogeneity, while noting that the OLS results are qualitatively similar. Consistent with H1, the coefficient on *INHOUSE_TAX_PLANNING* is significantly negative (t = –3.39). This indicates that greater in-house tax planning investments are associated with more tax savings. The effect is also economically significant; given the mean number of employees (24.74) (in thousands), the coefficient of -0.0181 suggests that having an additional tax planning professional is associated with a reduction in *CashETR3* of 0.07 percentage points [(1/24.74) × (–0.0181) × 100% = –0.07%]. This reduction would translate into an annual cash tax saving of about $641,900 [0.07% × 917 million, which is the sample

average pre-tax income].[26] To put this figure into perspective, the average annual base salary for a tax manager in the U.S. is $114,933 in 2016, according to Salary.com.[27]

In addition, the coefficient on *INHOUSE_TAX_GENERAL* is also significantly negative (t = –2.26), indicating that general tax investments are also associated with lower cash ETR. The coefficient on *INHOUSE_TAX_GENERAL* is smaller (–0.0092) than that on *INHOUSE_TAX_PLANNING* (–0.0181). The economic effect of having an additional general tax professional is a reduction in *CashETR3* of 0.037 percentage points [(1/24.74) × (–0.0092) × 100% = –0.037%], or an annual cash tax saving of $339,290 [0.037% × 917 million]. This suggests that a general tax professional has a smaller effect on tax savings than a tax planning professional, consistent with the notion that the employees in tax departments without a specific focus cover both tax planning and compliance.

The coefficient on *INHOUSE_TAX_COMPLIANCE* is positive but insignificant. The positive coefficient suggests that firms that invest more in tax compliance may need to pay more tax, consistent with a trade-off between tax planning and tax compliance. The coefficients on the control variables are similar to those reported in prior studies.[28]

Overall, the results suggest that more in-house tax planning investments are associated with greater tax avoidance, consistent with H1. Greater general tax investments are also associated with more tax savings. In contrast, in-house tax compliance investments are not associated with tax savings.

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[26] Note that the average pre-tax income might appear to be high because all firm-years with negative pre-tax income are excluded from the sample, as mentioned above.

[27] This discussion leads to the question why some firms appear to "leave money on the table" by not hiring additional tax employees. This can be due to the friction in the labor market for certain firms and certain years. Moreover, here we only consider the benefits of tax planning (in the form of reduced tax rates) without taking into account the potential costs of tax planning, which can include reputational cost, political cost, adverse media attention for being tax aggressive and "a poor corporate citizen," and agency costs between managers and shareholders (Balakrishnan et al. 2012; Graham et al. 2014). Graham et al.'s (2014) survey evidence suggests that such costs are important factors influencing firms' tax decisions.

[28] In a sensitivity test, we replace *TAXFEES_DUMMY* by the natural logarithm of tax fees paid to the auditor; the coefficient on this variable is positive but insignificant. This suggests that the relationship between tax fees paid to auditors and tax rate is sensitive to model specifications.

4.3 In-house Tax Compliance Investments and Tax Risk: Test of H2

Table 4 reports the regression results of tax risk using both the control function approach (Column (1)) and the OLS regression (Column (2)). H2 implies that in-house tax compliance investments (*INHOUSE_TAX_COMPLIANCE*) have a negative effect on tax risk.

Again, we focus the discussion on the results based on the control function approach. As reported in Column (1), *INHOUSE_TAX_COMPLIANCE* is significantly negatively associated with *SD_CashETR* (t = –3.85). That is, consistent with H2, firms that invest more in tax compliance have less volatile cash ETR, i.e., lower tax risk. In terms of economic significance, an additional tax compliance professional is associated with a reduction in *SD_CashETR* of 0.06 percentage points [(1/24.74) × (–0.0160) × 100% = –0.06%]. Note that the mean *SD_CashETR* is 10 percentage points in the sample.

We also find that the coefficient on *INHOUSE_TAX_GENERAL* is significantly negative (*t* = –2.30). That is, more general in-house tax investments are also associated with lower tax risk. At the same time, the coefficient on *INHOUSE_TAX_GENERAL* (-0.0111) is smaller than that on *INHOUSE_TAX_COMPLIANCE* (-0.0160), suggesting that a general tax professional has a smaller effect on tax risk than a tax compliance professional.

The coefficient on *INHOUSE_TAX_PLANNING* is insignificant, suggesting that in-house tax planning employees have no impact on tax risk. The results on the control variables are similar to prior studies.

When we use the OLS regression (Column (2)), we find that the coefficient on *INHOUSE_TAX_COMPLIANCE* is still significantly negative (*t* = –1.81). However, the coefficient on *INHOUSE_TAX_GENERAL* is insignificant and the coefficient on *INHOUSE_TAX_PLANNING* is significantly positive (*t* = 2.03), suggesting that more tax planning employees can lead to higher tax risk, which is consistent with the trade-off between saving taxes and reducing tax risk.

Taken together, the results in Tables 3 and 4 indicate that consistent with H1 and H2, firms that invest more in in-house tax planning save more taxes and firms that invest more in in-house tax compliance have less volatile tax rates and lower tax risk. Firms with more general in-house tax investments exhibit greater tax avoidance and lower tax risk. When using the OLS regression, we find some evidence that investments in tax planning increase tax risk and likewise, investments in tax compliance reduce tax savings, indicative of the potential trade-off between saving taxes and reducing tax risk (Neuman et al. 2013; Graham et al. 2014).

4.4 Change Analyses

In this section, we conduct change analyses to provide additional (Grainger) causal evidence on the link from in-house tax investments to tax avoidance and risk.[29] Based on Equation (1), we use the following specification for change analyses:

$$\begin{aligned}\Delta Tax\ Avoid_t \text{ or } \Delta Tax\ Risk_t = {} & \beta_0 + \beta_1\, \Delta INHOUSE\_TAX\_PLANNING_{t-1} \\ & + \beta_2\, \Delta INHOUSE\_TAX\_COMPLIANCE_{t-1} \\ & + \beta_3\, \Delta INHOUSE\_TAX\_GENERAL_{t-1} \\ & + \gamma\, \Delta Controls_t + Industry\ Fixed\ Effects_t + Year\ Fixed\ Effects + \varepsilon\end{aligned} \tag{3}$$

The independent variables of interest are $\Delta INHOUSE\_TAX\_PLANNING_{t-1}$, $\Delta INHOUSE\_TAX\_COMPLIANCE_{t-1}$, and $\Delta INHOUSE\_TAX\_GENERAL_{t-1}$. For these measures, we use lagged change (from *t*–2 to *t*–1) because we want to examine the impact of increasing or decreasing the number of in-house tax professionals on subsequent tax avoidance and risk measures. We measure change in tax avoidance as the change in annual cash ETR (from year t-1 to year t), rather than the change in 3-year average cash ETR,

[29] Our discussions with tax practitioners confirm the importance of hiring tax professionals to address tax issues. For 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 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 – she 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."

because the change in annual ETR would better capture the immediate effect of change in tax investments, if any. Based on a survey of tax executives, Hoopes, Mescall, and Pittman (2012) report that 69.2 percent of a firm's tax positions can be adjusted within one year.[30] We use the same control variables as in Equation (1), except that we use annual changes in the control variables.

Panel A of Table 5 reports the results of the change analyses. We use OLS regressions because the change analyses are less likely to be subject to endogeneity, compared to the level analyses. In the regression of Δ*CashETR* (Column (1)), the coefficients on both Δ*INHOUSE_TAX_PALNNING* and Δ*INHOUSE_TAX_GENERAL* are significantly negative (t = –2.24 and –1.83, respectively), indicating that increases in tax planning and general tax professionals lead to a subsequent reduction in *CashETR*, and vice versa. The coefficient on Δ*INHOUSE_TAX_COMPLIANCE* is insignificant. In the regression of *ΔSD_CashETR* (Column (2)), we find that the coefficient on Δ*INHOUSE_TAX_GENERAL* is significantly negative (*t* = –2.41), indicating that increases in general tax investments can lead to a subsequent decrease in tax risk, and vice versa.

Increases versus Decreases in In-house Tax Investments

The analyses above document the effect of changes in in-house tax investments on changes in tax avoidance and tax risk. However, it is unclear whether positive and negative changes have symmetric effect. Understanding this is important because it can shed light on the separate effects of hiring additional tax professionals and losing existing tax professionals. Ex ante, we expect that the effects of changes in tax investments are driven more by positive changes than by negative changes, because once a firm's tax planning and compliance practices are in place, tax outcomes are unlikely to be impacted by the departure

[30] According to Hoopes et al. (2012), the tax executives responded 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."

of some tax employees in the short run.[31]

To examine this conjecture, we break down the change variables into positive (Δ^{+}) and negative (Δ^{-}) changes, which are defined as the change when the change is positive and negative, respectively, and zero otherwise. Panel B of Table 5 reports the regression results, Column (1) for tax avoidance and Column (2) for tax risk. As reported in Column (1), the coefficient on Δ^{+}*INHOUSE_TAX_PLANNING* is significantly negative (t = –2.12), but the coefficient on Δ^{-}*INHOUSE_TAX_PLANNING* is insignificant. This result suggests that hiring additional tax planning professionals can lead to a subsequent decrease in cash ETR, while cash ETR does not appear to change significantly one year after the departure of existing tax professionals.

In Column (2), we find that both Δ^{+}*INHOUSE_TAX_COMPLIANCE* and Δ^{+}*INHOUSE_TAX_GENERAL* have a significantly negative effect on the change in tax risk (t = –1.68 and –1.86, respectively). Again, the negative changes do not affect tax risk significantly. This result suggests that firms' cash ETR becomes less volatile after the hiring of new tax employees (compliance and general), but cash ETR volatility does not increase significantly in the short run after the departure of existing tax employees. In addition, there is evidence that firms' cash ETR volatility decreases as the number of tax planning employees decreases; the coefficient on Δ^{-}*INHOUSE_TAX_PLANNING* is significantly positive (t = 1.76), consistent with the OLS results in Column (2) of Table 4 presented earlier.

Overall, the results of the change analyses are largely consistent with our main results and are mainly driven by increases in tax investments.

4.5 Cross-sectional Analyses

In this section, we conduct cross-sectional analyses to enhance our understanding of the

[31] We thank an anonymous reviewer for this point.

conditions under which in-house tax professionals are more or less effective in tax planning and compliance. We focus on two aspects: (1) the use of auditor-provided tax services, and (2) prior tax avoidance and tax risk levels.

4.5.1 The Use of Auditor-Provided Tax Services: Test of H3

To shed light on the interplay between internal and external tax investments, we examine the interaction effects of in-house tax investments and the use of auditor-provided tax services on tax avoidance and tax risk. For this purpose, we add the interactions of the in-house tax investment variables and *TAXFEES_DUMMY* to Equation (1).[32] We use the control function approach to address the endogeneity of in-house tax investments and the interaction terms (Wooldridge 2010, 2015).

Table 6 reports the regression results, Column (1) for tax avoidance and Column (2) for tax risk. For simplicity we do not report the results on the control variables. As shown in Column (1), the coefficients on *INHOUSE_TAX_PLANNING* and *INHOUSE_TAX_GENERAL* remain significantly negative. More importantly, we find that the coefficient on *INHOUSE_TAX_GENERAL* × *TAXFEES_DUMMY* is significantly positive (t = 3.13), indicating that the effect of general tax investments on tax avoidance is weaker when the firm also uses auditor-provided tax services. This moderating effect, however, does not seem to exist for tax planning investments.

With respect to tax risk, as reported in Column (2), we find that the coefficients on *INHOUSE_TAX_COMPLIANCE* and *INHOUSE_TAX_GENERAL* remain significantly negative. Also, their interaction terms with *TAXFEES_DUMMY* are both significantly positive (t = 2.39 and 3.74, respectively). These results suggest that the negative effect of in-house tax compliance and general tax investments on tax risk is lower when the firm uses

[32] The inferences are 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. Auditor-provided tax services are likely endogenous. Not controlling for the endogeneity of auditor-provided tax services is a limitation of this analysis.

auditor-provided tax services.

Overall, the above results suggest that in-house tax investments and auditor-provided tax services appear to be substitutes, consistent with H3.

As mentioned earlier, a limitation of our study is that there is no publicly available data on external tax services provided by non-auditors. We control for the use of auditor-provided tax services throughout the analyses and examine the interaction of internal tax investments and auditor-provided tax services. Our main results are also similar before and after controlling for the use of auditor-provided tax services. This suggests that the confounding effects of external tax services, if any, are likely small. We also perform analyses regressing auditor-provided tax services on the number of tax employees with past work experiences in Big N firms or in the firm's current auditor, to test the conjecture that tax employees' past work experiences lead to a positive link between in-house tax investments and external tax services. We do not find any supportive evidence for this conjecture. Nonetheless, due to the lack of control for total external tax services, we cannot completely rule out the possibility that the documented effect of internal tax investments might to some extent capture that of external tax investments and is hence overstated.

4.5.2 Prior Tax Avoidance and Tax Risk of the Firm: Test of H4

Hypothesis H4 predicts that if a firm has underperformed in tax planning and compliance compared to its peers, the effects of new tax recruits on the firm's tax avoidance and tax risk will be greater. To test H4, we construct two measures to capture how well a firm performs in tax planning and compliance relative to its industry peers in the past. *HIGH_CashETR* is an indicator variable that equals 1 if the firm's *CashETR* is higher than the average *CashETR* of industry peers in year *t*–2, and zero otherwise. Similarly, *HIGH_SD_CashETR* is an indicator variable that equals 1 if the firm's *SD_CashETR* is higher than the average *SD_CashETR* of industry peers in year *t*–2, and zero otherwise. The

industry peers include firms with similar size in the same industry, following Balakrishman, Blouin, and Guay (2012).[33] *HIGH_CashETR* and *HIGH_SD_CashETR* thus identify firms that have performed worse than their peers in tax avoidance and tax risk. We add the interactions of these two indicator variables with the change in in-house tax investment variables to Equation (3). We use the change specification since the predictions are about the dynamics of tax avoidance and risk.

Panels A and B of Table 7 report the results for tax avoidance and tax risk, respectively. In Panel A, the coefficient on Δ*INHOUSE_TAX_PLANNING* is significantly negative (t = –2.01). More importantly, the coefficients on Δ*INHOUSE_TAX_PLANNING* × *HIGH_CashETR* and Δ*INHOUSE_TAX_GENERAL* × *HIGH_CashETR* are both significantly negative (t = –2.83 and –4.98, respectively), suggesting that the effects of the change in tax planning and general tax investments are more prominent when the firm has a higher tax rate than industry peers in the past.

In Panel B, for tax risk, the coefficient on Δ*INHOUSE_TAX_GENERAL* is significantly negative (t = –2.17). More importantly, the coefficient on Δ*INHOUSE_TAX_COMPLIANCE* × *HIGH_CashETR* is significantly negative (t = –2.26). This result suggests that the effect of the change in tax compliance investments on the change in tax risk is significantly negative only when the firm's tax risk is higher than industry peers in the past.

In sum, the above results suggest that when a firm's tax planning and compliance have under-performed relative to its industry peers, the effect of new tax professional hires on the firm's tax avoidance and risk is stronger, as such firms have more room for improvement. This result is also consistent with the peer-learning effects suggested in prior tax literature

[33] Note that we examine year *t-2* because the changes in tax avoidance and tax risk are measured from year *t-1* to year *t*. Our results are robust to defining *HIGH_CashETR* and *HIGH_SD_CashETR* over the past three years.

(Brown 2011; Brown and Drake 2014; Kim et al. 2015; Kubick et al. 2015).

5 Additional Analyses and Sensitivity Tests

5.1 Overall In-house Tax Investments

In the main analyses, we find that in-house tax planning investments increase tax avoidance and in-house tax compliance investments reduce tax risk. General tax investments reduce both tax rate and tax risk. As tax planning, compliance and general investments are components of the overall internal tax investments, in this section, we explore the effect of the overall in-house tax investments (*INHOUSE_TAX*) on tax avoidance and tax risk.

Table 8 presents the results. We use the same methodology and model specifications as the main analyses (Table 3, 4, 5). Columns (1) and (2) report the level analyses using the control function approach, Columns (3) and (4) report the change analyses using the OLS regressions, and Columns (5) and (6) separately examine positive and negative changes. The results are consistent with the main analyses. We find that *INHOUSE_TAX* is significantly negatively associated with both *CashETR3* and *SD_CashETR* (t = –2.50 and –2.21, respectively). In addition, Δ*INHOUSE_TAX* is significantly negatively associated with Δ*CashETR and* Δ*SD_CashETR* (t = –2.20 and –3.33, respectively). When we separately examine positive and negative changes, we find that only increases in overall tax investments (Δ^{+}*INHOUSE_TAX*) have a significantly negative impact on subsequent changes in tax avoidance and tax risk (t = –2.07 and –3.90, respectively); decreases in overall tax investments do not have an immediate effect on tax rate or risk.

Given that the inferences using overall tax investments are similar to those presented above, we use overall tax investments for simplicity in the subsequent additional and sensitivity tests.

5.2 Prior External Work Experiences of In-house Tax Employees

In-house tax employees have different work experiences; some of them have worked externally in accounting, tax consulting, law firms, or financial institutions, while others have only worked in corporate settings. There is no prior evidence on whether and which external experiences of tax employees benefit the firm more after they join the firm's in-house tax team. In this section we fill the gap by examining the incremental effects of prior external work experiences of tax employees on tax avoidance and risk.

In-house tax employees with prior external experiences have gained expertise from serving a large number of external tax clients. Such expertise can benefit a firm's internal tax planning and compliance. In fact, the job postings for in-house tax employees often emphasize prior external experiences (in public accounting or law firms) as desirable attributes. At the same time, in-house tax professionals with external work experiences will have less experience in corporate tax departments. To the extent that corporate experience is also valuable to in-house tax planning and compliance, it is unclear whether we will detect a significant incremental effect of prior external work experiences.

For this test, we construct a new variable, *INHOUSE_TAX_EXTERNAL*, which is measured as the number of in-house tax employees with prior work experience in Big N, non-Big N accounting or tax consulting firms, law firms, or financial institutions, scaled by the firm's total number of employees. We add this variable to Equation (1). Table 9, Columns (1) and (2), report the results using the control function approach. Since *INHOUSE_TAX_EXTERNAL* is a component of *INHOUSE_TAX*, the coefficient on *INHOUSE_TAX_EXTERNAL* captures the incremental effect of tax employees with external work experience. The coefficient on *INHOUSE_TAX* is significantly negative for both *CashETR3* and *SD_CashETR* (t = –2.11 and –2.06, respectively), consistent with the results in Table 8. Moreover, for *CashETR3*, the coefficient on *INHOUSE_TAX_EXTERNAL* is significantly negative (t = –2.33), suggesting that in-house tax departments are better able to

save taxes when more tax employees have external work experiences. For *SD_CashETR*, the coefficient on *INHOUSE_TAX_EXTERNAL* is negative but not statistically significant.

We then test the effect of different types of external experiences. For example, prior work experience in accounting firms may lead to greater expertise in designing tax strategies that also satisfy financial reporting objectives, while prior experiences in law firms may lead to deeper knowledge of compliance with tax laws. For this purpose, we construct four variables: *INHOUSE_TAX_BIGN*, *INHOUSE_TAX_CPAFIRM*, *INHOUSE_TAX_LAWFIRM*, and *INHOUSE_TAX_ FINANCIAL*. They are measured as the number of tax employees with past experiences in Big N, Non-Big N accounting or tax consulting firms, law firms, and financial institutions, respectively, scaled by the firm's total number of employees.

Table 9, Columns (3) and (4), report the results using the control function approach. The results in Column (3) suggest that the incremental effect of external work experiences on tax avoidance is mainly driven by experiences in Big N (t = –1.78) and non-Big N accounting or tax consulting firm (t = –1.87). The results in Column (4) suggest that past work experiences in Big N and law firms are incrementally useful for tax risk management. The coefficients on both *INHOUSE_TAX_BIGN* and *INHOUSE_TAX_LAWFIRM* are significantly negative (t = -2.75 and -3.62, respectively).[34]

Overall, the findings suggest that in-house tax professionals' prior external work experiences contribute incrementally to the firm's tax planning and compliance. In particular, prior experiences in accounting and tax consulting firms are incrementally useful for tax planning and prior experiences in Big N and law firms are incrementally useful for tax compliance.

5.3 Sensitivity Tests – Alternative Model Specifications and Research Design

[34] As discussed above, firms with in-house tax employees with Big N work experience are not more likely to use auditor-provided tax services. Thus, the coefficient on *INHOUSE_TAX_BIGN* is not capturing the effect of external tax service providers.

We conduct a series of sensitivity tests to ensure that our main results are robust. First, we add additional control variables that may affect firms' tax rate or risk to Equations (1) and (2). Specifically, we control for firm age (*LN_AGE*) and sales growth (*SALES_GROWTH*) because younger firms and fast-growing firms might have different tax planning opportunities from other firms.[35] We add advertising expenditures (*ADVERTISING*) to control for the potential effect of reputational costs on tax avoidance and risk (Gallemore et al. 2014). We control for equity income (*EQUITY_EARNINGS*) and minority interest's earnings (*MINORITY_INTERESTS*), variables that may indicate tax shelter usage (Lisowsky 2010; Lisowsky et al. 2013). Lastly, we add the estimated tax benefits associated with option-based compensation (*OPTION_TAX_BENEFITS*) to control for the effect of option-based compensation (Gleason and Mills 2011; Austin 2014). As reported in Columns (1) and (2) of Table 10, Panel A, the results on *INHOUSE_TAX* are robust to the inclusion of these additional control variables.

Second, as an alternative way to address endogeneity, we employ the instrumental variable (IV) approach. We estimate the determinant model of the in-house tax department size (*INHOUSE_TAX*) (Equation (2)) together with Equation (1) using the GMM approach.[36] As reported in Columns (3) and (4) of Table 10, Panel A, we continue to find a significantly negative association between *INHOUSE_TAX* and both tax rate and tax risk, consistent with the main findings.

Third, we use alternative measures of in-house tax investments: (i) the natural logarithm of the number of tax employees, and (ii) an expenditure-based measure, defined as the total

[35] Controlling for firm age also controls for the possibility that older firms may be more likely to have tax employees who do not have *LinkedIn* accounts.
[36] The GMM (generalized method of moments) approach possesses merits similar to those of the system of simultaneous equations (Cameron and Trivedi 2005); the inferences are the same if we use the 2SLS approach.

annual salary of the firm's tax employees deflated by total assets.[37] The analyses (untabulated) lead to the same inferences.

Fourth, Jiang, Robinson, and Wang (2015) find that tax employees who have worked in the IRS are more effective in lowering firms' tax rates. In an untabulated analysis, we exclude all the firms with tax employees who have worked in the IRS.[38] The inferences remain the same, indicating that our results are not driven by tax employees with an IRS background.

In sum, our results are robust to alternative model specifications, alternative research design, and alternative measures of tax investments.

5.4 Alternative Proxies for Tax Avoidance and Tax Risk

We use alternative proxies for tax avoidance and tax risk to ensure the robustness of the results. For brevity, we only report the results using the control function approach; the inferences remain the same if we use the OLS regressions.

First, we use industry-size-adjusted measures. Specifically, for tax avoidance, we use *AdjCashETR3*, defined as the firm's three-year cash ETR (*CashETR3*) minus the average *CashETR3* of its peers – firms with similar size in the same industry, following Balakrishnan et al. (2012). For tax risk, we use *AdjSD_CashETR*, defined as the difference between the firm's and its peers' average *SD_CashETR*.

Second, we use three-year average GAAP ETR (*GAAP_ETR3*) and the standard deviation of annual GAAP ETR (*SD_GAAP_ETR*) to capture tax avoidance and tax risk, respectively. Based on survey data, Graham et al. (2014) find that top management in U.S. public firms cares about not only the cash effect but also the book effect of tax planning.

[37] The total salary of a firm's tax employees is calculated as the sum of the salary of individual tax employees. The salary of a tax employee 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 headquarter location, as reported in Payscale.com, a major human capital data provider in the U.S. We find similar results using salary information from Salary.com.
[38] Only two percent of the tax employees in our sample have IRS related work experiences.

Consistent with this notion, Dyreng et al. (2010) document significant effects of top executives' compensation structure on both cash and GAAP ETRs. In addition, Dichev, Graham, Harvey, and Rajgopal (2013) find that practitioners cite the fluctuation in GAAP ETR as one of the main factors that impair earnings quality.[39]

Panel B of Table 10 reports the results based on these alternative proxies. We find that the inferences remain the same: in-house tax investments reduce both tax rate and tax risk.

6 Conclusion

This study analyzes a major input in corporate tax planning and compliance: a firm's in-house human capital tax investments. Using hand-collected data on corporate tax employees for a sample of 4,986 firm-years from non-financial S&P1500 firms over the period 2009-2014, we find that greater tax planning investments are associated with significantly lower tax rates, greater tax compliance investments are associated with significantly less volatile tax rates, and greater general tax investments are associated with both lower and less volatile tax rates. The change analyses provide confirming evidence. We further find that the impact of in-house tax investments is stronger for firms that do not use auditor-provided tax service, consistent with the substitution effect of in-house tax investments and auditor-provided tax services. In addition, the impact of changes in in-house tax investments is stronger when the firm has under-performed its industry peers in tax planning and compliance in the past. The results are robust to using alternative proxies for tax avoidance and tax risk, alternative model specifications, and alternative measures of in-house tax investments.

Overall, we document strong and robust evidence that a larger in-house tax department is associated with more tax avoidance and lower tax risk. This study contributes to the

[39] The volatility of GAAP ETR may be influenced by the firm's financial reporting practices (Dichev et al. 2013). Hence, we do not use this measure as the primary proxy for tax risk.

accounting literature by looking inside the "black box" of corporate in-house tax departments and by providing comprehensive evidence on how firms' tax planning and compliance are affected by in-house tax team's focus, size, and prior experiences.

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Appendix A: Description of Data Collection from *LinkedIn*

Our sample selection begins with identifying a list of non-financial S&P 1500 companies in 2014 as our sample firms. For each sample firm, we use *LinkedIn* to search for the names of *LinkedIn* members who has worked for or is 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." [40] We 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 or payroll tax. We further exclude the tax employees who are unlikely to contribut to tax planning and compliance or whose job is temporary, such as tax clerks and tax interns. 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. As an example, an extract of the search results for Ford Motor's current tax employees is provided below.

Since our individual-level data contains both current and past tax employees of the sample firms, we are able to trace back the composition of the tax departments of the sample firms as long as the tax employees have *LinkedIn* accounts that include their complete work history. Going too far back in time can introduce estimation errors of missing past tax employees. For example, some tax professionals 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 the 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. Based on the individual-level data, we construct a dataset containing year, firm, and

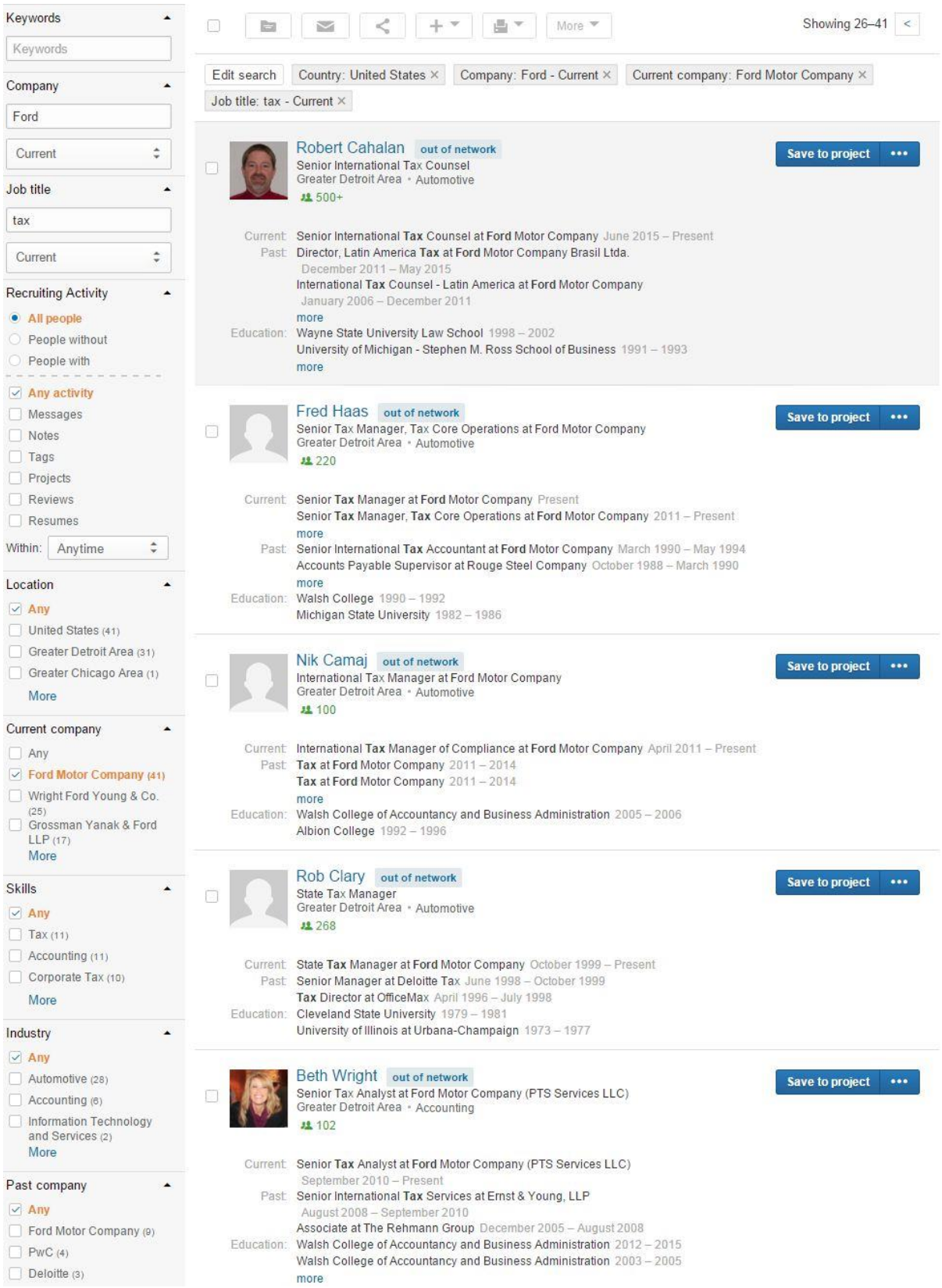
[40] We do not restrict our search to those members who work in the accounting function because depending on the organization structure, firms may have tax employees in other divisions (e.g., legal). We thank Michelle Hanlon for this suggestion.

the individual tax employees who work for the firm in a given year. The final sample consists of 4,986 firm-years, covering 36,375 individual-years, over the period 2009-2014.

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," "Tax Associate." Tax managers include those with job titles including "Tax Manager," "Senior Tax Lawyer," "Tax Attorney," "Global Tax Accounting Manager." Tax executives include those with job titles including "Tax Director," "VP Tax," "Chief Tax Counsel," "International Tax Counsel." For the Ford Motor example, Robert Cahalan is classified as a tax executive, Fred Hass, Nik Camaj, and Rob Clary as tax managers, and Beth Wright as a tax analyst.

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.

Appendix A (Cont'd)



Appendix B: Variable Definitions

Variables	Definitions and Sources
In-house tax department	
TAX_TOTAL	The total number of in-house tax employees of a firm. Source: *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). Source: *LinkedIn.*
INHOUSE_TAX_ PLANNING	*INHOUSE_TAX* for firms with a tax planning focus tax department, and zero otherwise. A tax department is classified as tax planning focus if the most senior tax executive's job title contains the word "planning" (e.g., "Senior Director of Tax Planning"). Source: *LinkedIn.*
INHOUSE_TAX_ COMPLIANCE	*INHOUSE_TAX* for firms with a tax compliance focus tax department, and zero otherwise. A tax department is classified as tax compliance focus if the most senior tax executive's job title contains the word "compliance" (e.g., "Senior Director of Tax Compliance"). Source: *LinkedIn.* For tax departments with multiple executives of similar titles, we use professional prefixes such as "Head" or "Senior" to identify the most senior tax executive.
INHOUSE_TAX_ GENERAL	*INHOUSE_TAX* for firms whose tax department is not tax planning focus or tax compliance focus. Source: *LinkedIn.*
Δ*INHOUSE_TAX*	Change in *INHOUSE_TAX*, from year *t*–2 to *t*–1.
Δ*INHOUSE_TAX_ PLANNING*	Change in *INHOUSE_TAX_PLANNING*, from year *t*–2 to *t*–1.
Δ*INHOUSE_TAX_ COMPLIANCE*	Change in *INHOUSE_TAX_COMPLIANCE*, from year *t*–2 to *t*–1.
Δ*INHOUSE_TAX_GENERAL*	Change in *INHOUSE_TAX_GENERAL*, from year *t*–2 to *t*–1.
INHOUSE_TAX_EXTERNAL	The total number of in-house tax employees with prior work experience in a Big N firm, in a non-Big N accounting or tax consulting firm, in a law firm, or in a financial institution, divided by the total number of employees of the firm (in thousands). Source: *LinkedIn.*
INHOUSE_TAX_BIGN	The total number of in-house tax employees with prior work experience in a Big N firm, divided by the total number of employees of the firm (in thousands). Source: *LinkedIn.*
INHOUSE_TAX_CPAFIRM	The total number of in-house tax employees with prior work experience in a non-Big N accounting or tax consulting firm, divided by the total number of employees of the firm (in thousands). Source: *LinkedIn.*
INHOUSE_TAX_LAWFIRM	The total number of in-house tax employees with prior work experience in a law firm, divided by the total number of employees of the firm (in thousands). Source: *LinkedIn.*

INHOUSE_TAX_FINANCIAL	The total number of in-house tax employees with prior work experience in a financial institution, divided by the total number of employees of the firm (in thousands). Source: *LinkedIn.*
Tax avoidance and tax risk	
CashETR3	Three-year average cash ETR, calculated as the sum of the firm's cash tax paid over three years centered on year *t* 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. Source: *Compustat.*
CashETR	Annual Cash ETR, 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. Source: *Compustat*.
SD_CashETR	Standard deviation of annual *Cash ETR* over the three years centered on year *t*. Source: *Compustat*.
Δ*CashETR*	Change in *CashETR* from year *t*–1 to year *t*. Source: *Compustat*.
Δ*SD_CashETR*	Change in *SD_CashETR* from year *t*–1 to year *t*. Source: *Compustat*.
Firm characteristics	
SIZE	Average total assets over three years. We use the natural logarithm of average total assets in the regressions. Source: *Compustat*.
ROA	Average pre-tax income (excluding special items) over three years divided by average lagged assets over the same period. Source: *Compustat*.
MTB	Average market value of equity over three years divided by the average book value of common equity over the same period. Source: *Compustat*.
LEV	Leverage, calculated as the average long-term debt over three years divided by average lagged assets over the same period. Source: *Compustat*.
PPE	Capital intensity, calculated as the average net property, plant, and equipment over three years divided by average lagged assets over the same period. Source: *Compustat*.
R&D	Average research and development expenditures over three years divided by average lagged assets over the same period. Source: *Compustat*.
INTANG	Average intangible assets over three years divided by average lagged assets over the same period. Source: *Compustat*.
INVENTORY	Average inventory over three years divided by average lagged assets over the same period. Source: *Compustat*.
NOL	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. Source: *Compustat*.

Δ*NOL*	Average change in loss carry forward over three years divided by average lagged assets over the same period. Source: *Compustat*.
FOR_INCOME	Average foreign income over three years divided by average lagged assets over the same period. Source: *Compustat*.
FOR_DUMMY	Indicator variable for positive average three-year foreign income, set as 1 if *FOR_INCOME* is positive and 0 otherwise. Source: *Compustat*.
LN_SEGMENTS	Natural logarithm of one plus the average number of business segments over three years. *SEGMENTS* is the average number of business segments over three years. Source: *Compustat*.
LN_HAVENS	Natural logarithm of one plus the average number of material subsidiaries in tax haven jurisdictions over three years, based on Exhibit 21 in 10-K. *HAVENS* is the average number of material subsidiaries in tax haven jurisdictions over three years. Source: *Professor Scott Dyreng*. We thank Scott Dyreng for providing this data.
ICW_DUMMY	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	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_PI	Standard deviation of pre-tax book income (excluding special items and deflated by total assets) over three years. Source: *Compustat*.
Instrumental variable	
TAX_EDUCATION	The number of graduate tax programs (e.g., LLM in Tax and MS in Tax) offered by the universities in the state of the firm's headquarter in 2004. Source: *U.S. News Education, TaxTalent, TaxProf Blog, and universities' websites*.

Appendix C: Determinants of Corporate Tax Department Size

This table reports the OLS regression results on the determinants of *INHOUSE_TAX* based on 4,986 firm-years from S&P 1500 firms with available data over the period 2009-2014. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	INHOUSE_TAX
TAX_EDUCATION	0.0272***
	(4.34)
SIZE	-0.2640***
	(-14.27)
ROA	0.4548*
	(1.65)
MTB	-0.0177*
	(-1.86)
LEV	0.3860*
	(1.68)
PPE	-2.2945***
	(-2.96)
R&D	0.2366
	(0.28)
INTANG	-0.8629***
	(-3.28)
INVENTORY	-1.2260***
	(-2.91)
NOL	-0.1024
	(-1.54)
Δ*NOL*	0.0845
	(0.17)
FOR_DUMMY	-0.0850
	(-0.66)
FOR_INCOME	-0.9870
	(-0.96)
LN_SEGMENTS	-0.1046
	(-1.17)
LN_HAVENS	-0.0653**
	(-2.03)
ICW_DUMMY	-0.1247
	(-0.54)
TAXFEES_DUMMY	0.3430***
	(3.55)
Year + Industry FEs	Included
N	4,986
Adj. R^2	0.38

Table 1 Descriptive Statistics on Tax Department Size and Tax Employees

Our full sample includes 4,986 firm-years from S&P 1500 firms with available data over the period 2009-2014. 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). *TAX_TOTAL* is the number of tax employees in the tax department and *INHOUSE_TAX* is *TAX_TOTAL* scaled by the number of employees in the firm (in thousands).

Panel A: Descriptive Statistics on Tax Department Size

	N	Mean	S.D.	Q1	Median	Q3
TAX_TOTAL	4,986	7.30	11.51	1.00	4.00	8.00
INHOUSE_TAX	4,986	0.84	1.15	0.15	0.45	1.03

Panel B: Descriptive Statistics on Tax Department Size by Firm Size, Industry, and Year

By Firm Size

Decile	N	Mean *Total Assets* (*Billions*)	Mean *TAX_TOTAL*	Mean *INHOUSE_TAX*
1	998	0.42	1.96	1.33
2	997	1.16	2.93	0.89
3	997	2.67	4.57	0.81
4	997	6.88	8.02	0.65
5	997	43.29	19.0	0.51

By Industry

Industry	N	Mean *TAX_TOTAL*	Mean *INHOUSE_TAX*
SIC 01-09 Agriculture, Forestry, Fishing	16	7.19	0.50
SIC 10-14 Mining	202	6.47	1.42
SIC 15-17 Construction	60	6.13	0.66
SIC 20-39 Manufacturing	2,434	6.98	0.87
SIC 40-49 Transportation & Public Utilities	591	7.79	0.76
SIC 50-51 Wholesale Trade	219	5.64	0.85
SIC 52-59 Retail Trade	512	8.27	0.30
SIC 70-99 Services & Others	952	7.91	0.97

By Year

Year	N	Mean *TAX_TOTAL*	Mean *INHOUSE_TAX*
2009	930	6.39	0.81
2010	951	6.85	0.84
2011	968	7.28	0.85
2012	963	7.63	0.85
2013	978	8.03	0.85
2014*	196	8.49	0.71

* Note that the sample size is much smaller in 2014 than in the other years. Our measures of tax avoidance and tax risk are based on three years' data (centered on the current year). Thus we need 2015 financial data in order to calculate the tax measures for 2014. At the time of data collection, many sample firms' 2015 financial data is not yet available.

Table 1 (Cont'd)

Panel C: Tax Employee Characteristics

The full sample includes 36,375 employee-year observations for the 4,986 firm-years. This panel presents seniority, educational background and qualifications, and prior work experience of tax employees. We classify tax employees into tax analysts, tax managers, and tax executives based on the employees' self-reported profiles on *LinkedIn*. Tax executives include those with job titles "Chief Tax Officer," "VP Tax," "Tax Director," "Head of Tax," and "Tax Counsel." Tax managers include those with job titles "Tax Manager," "Tax Lawyer," "Tax Attorney," and "Tax Accounting Manager." Tax analysts include those with job titles "Tax Analyst," "Tax Specialist," "Corporate Tax Accountant," and "Tax Associate." Note that prior work experience sums to less than one across the categories because we only count these specific types of experiences.

	Number of employee-years	Percentage of the full sample
Full sample	36,375	100%
Seniority		
Tax executives	9,223	25%
Tax mangers	15,555	43%
Tax analysts	11,597	32%
Educational Background and Qualifications		
Undergraduate education in accounting	20,480	56%
MTax or MAcc (Tax Concentration)	10,314	28%
JD or LLM in Tax Law	4,841	13%
Other graduate degrees in business	11,219	31%
CPA holders	8,873	24%
Prior Work Experience		
BIG N Audit Firms	13,222	36%
As a Tax Partner	385	1%
As a Tax Manager	5,970	16%
Non-BIG N Accounting and Tax Consulting Firms	1,972	5%
Law Firms	2,589	7%
Financial Institutions	923	3%
IRS or Treasury	722	2%
Other Corporate Tax Departments (Manager or above)	5,244	14%

Table 2 Descriptive Statistics on Regression Variables

Panel A: Descriptive Statistics on Firm-Level Characteristics

Our full sample includes 4,986 firm-years from S&P 1500 firms with available data over the period 2009-2014. This panel presents the descriptive statistics on the firm-level characteristics, including in-house tax investments, tax avoidance and tax risk, and control variables.

	N	Mean	S.D.	Q1	Median	Q3
TAX_TOTAL	4,986	7.30	11.51	1.00	4.00	8.00
INHOUSE_TAX	4,986	0.84	1.15	0.15	0.45	1.03
INHOUSE_TAX_PLANNING	4,986	0.063	0.35	0.00	0.00	0.00
INHOUSE_TAX_COMPLIANCE	4,986	0.071	0.48	0.00	0.00	0.00
INHOUSE_TAX_GENERAL	4,986	0.71	1.13	0.00	0.31	0.90
Δ*INHOUSE_TAX*	3,418	0.008	0.38	-0.05	0.00	0.43
CashETR3	4,986	0.25	0.14	0.16	0.25	0.32
SD_CashETR	4,749	0.10	0.09	0.05	0.08	0.13
SIZE (*in millions*)	4,986	10,883	25,040	879	2,603	8,497
ROA	4,986	0.09	0.09	0.04	0.08	0.14
MTB	4,986	3.05	3.67	1.58	2.32	3.53
LEV	4,986	0.20	0.18	0.04	0.18	0.29
PPE	4,986	0.29	0.25	0.11	0.21	0.41
R&D	4,986	0.03	0.05	0.00	0.00	0.03
INTANG	4,986	0.24	0.22	0.05	0.18	0.38
INVENTORY	4,986	0.07	0.11	0.00	0.01	0.11
NOL	4,986	0.52	0.50	0.00	1.00	1.00
Δ*NOL*	4,986	0.00	0.03	0.00	0.00	0.00
FOR_DUMMY	4,986	0.62	0.48	0.00	1.00	1.00
FOR_INCOME	4,986	0.03	0.03	0.00	0.01	0.04
SEGMENTS	4,986	8.36	4.34	5.00	8.00	10.00
HAVENS	4,986	8.88	17.31	1.00	3.00	9.00
ICW_DUMMY	4,986	0.02	0.14	0.00	0.00	0.00
TAXFEES_DUMMY	4,986	0.83	0.38	1.00	1.00	1.00
SD_PI	4,986	0.04	0.06	0.01	0.03	0.05
TAX_EDUCATION	4,986	8.11	7.47	2.00	8.00	12.00

Table 2 (Cont'd)

Panel B: Correlation Table for In-house Tax Investments and Tax Avoidance and Risk

The full sample includes 4,986 firm-years from S&P 1500 firms with available data over the period 2009-2014. This table reports the Pearson correlations among in-house tax investment variables, tax avoidance and tax risk, and the instrumental variable *TAX_EDUCATION*. The correlations in shaded cells are significant at the 0.10 level (based on two-tailed tests). See Appendix B for variable definitions.

		(1)	(2)	(3)	(4)	(5)	(6)
(1)	*CashETR3*						
(2)	*SD_CashETR*	0.28					
(3)	*INHOUSE_TAX*	-0.05	0.08				
(4)	*INHOUSE_TAX_PLANNING*	-0.06	-0.01	0.19			
(5)	*INHOUSE_TAX_COMPLIANCE*	0.02	0.01	0.33	0.23		
(6)	*INHOUSE_TAX_GENERAL*	-0.05	0.08	0.76	-0.11	-0.09	
(7)	*TAX_EDUCATION*	-0.04	0.01	0.12	0.03	0.03	0.09

Table 2 (Cont'd)

Panel C: Correlation Table for Control Variables

The full sample includes 4,986 firm-years from S&P 1500 firms with available data over the period 2009-2014. This table 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 B for variable definitions.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1)	*INHOUSE_TAX*																	
(2)	*SIZE*	-0.24																
(3)	*ROA*	-0.05	-0.09															
(4)	*MTB*	0.01	-0.05	0.31														
(5)	*LEV*	-0.05	0.28	-0.17	-0.03													
(6)	*PPE*	-0.06	0.20	-0.04	-0.09	0.31												
(7)	*R&D*	0.20	-0.19	0.02	0.13	-0.23	-0.32											
(8)	*INTANG*	-0.04	0.09	-0.10	-0.01	0.24	-0.43	0.00										
(9)	*INVENTORY*	-0.09	-0.08	0.04	-0.05	-0.13	-0.11	-0.10	-0.18									
(10)	*NOL*	0.04	0.00	-0.13	-0.02	0.03	-0.20	0.09	0.17	0.01								
(11)	Δ*NOL*	0.00	0.02	-0.02	-0.01	0.01	0.02	0.00	0.00	-0.01	0.08							
(12)	*FOR_DUMMY*	0.00	0.12	0.04	0.02	-0.09	-0.33	0.19	0.16	0.04	0.22	-0.04						
(13)	*FOR_INCOME*	-0.02	0.18	0.28	0.10	-0.13	-0.17	0.24	0.00	-0.04	0.14	0.01	0.53					
(14)	*LN_SEGMENTS*	-0.04	0.28	-0.08	-0.07	-0.02	-0.15	0.06	0.10	-0.05	0.18	0.04	0.45	0.37				
(15)	*LN_HAVENS*	-0.06	0.33	-0.02	0.00	-0.02	-0.20	0.12	0.15	-0.07	0.18	0.05	0.44	0.46	0.43			
(16)	*ICW_DUMMY*	0.01	-0.08	-0.05	-0.01	0.00	-0.01	0.00	-0.01	0.04	0.03	0.00	-0.03	-0.02	-0.01	-0.03		
(17)	*TAXFEES_DUMMY*	-0.02	0.20	-0.01	0.03	0.04	-0.08	0.03	0.08	-0.02	0.07	0.01	0.17	0.12	0.14	0.16	0.02	
(18)	*SD_PI*	0.04	-0.15	-0.30	0.01	-0.10	-0.06	0.12	-0.05	-0.08	0.04	0.04	-0.06	-0.08	-0.01	0.00	0.04	-0.02

Table 3 In-house Tax Investments and Tax Avoidance

This table reports the regression results on the effect of in-house tax investments on tax avoidance, using the control function approach to address endogeneity (Column (1)) and using OLS (Column (2)). The full sample includes 4,986 firm-years from S&P 1500 firms with available data over the period 2009-2014. *STAGE1_RESIDUAL* is the residuals from the determinant model in Appendix C. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) Control Function *CashETR3*	(2) OLS *CashETR3*
INHOUSE_TAX_PLANNING	-0.0181***	-0.0148***
	(-3.39)	(-3.43)
INHOUSE_TAX_COMPLIANCE	0.0046	0.0087
	(0.71)	(1.50)
INHOUSE_TAX_GENERAL	-0.0092**	-0.0052***
	(-2.26)	(-2.98)
SIZE	-0.0050***	-0.0044***
	(-3.05)	(-2.80)
ROA	0.0974***	0.0981***
	(3.18)	(3.25)
MTB	0.0014**	0.0014**
	(2.30)	(2.40)
LEV	-0.0331**	-0.0341**
	(-2.40)	(-2.47)
PPE	-0.0915***	-0.0902***
	(-6.62)	(-6.57)
R&D	-0.3680***	-0.3758***
	(-5.97)	(-6.22)
INTANG	0.0024	0.0035
	(0.20)	(0.29)
INVENTORY	0.0446*	0.0478*
	(1.66)	(1.77)
NOL	-0.0085**	-0.0087**
	(-2.06)	(-2.12)
Δ*NOL*	0.1264	0.1272
	(1.48)	(1.53)
FOR_DUMMY	-0.0023	-0.0034
	(-0.39)	(-0.58)
FOR_INCOME	-0.4350***	-0.4537***
	(-6.30)	(-6.22)
LN_SEGMENTS	0.0091	0.0087
	(1.60)	(1.55)
LN_HAVENS	0.0025	0.0026
	(1.26)	(1.29)
ICW_DUMMY	0.0638***	0.0646***
	(3.11)	(3.09)
TAXFEES_DUMMY	0.0135***	0.0135***

	(2.70)	(2.69)
STAGE1_RESIDUAL	0.0056	
	(1.07)	
Year + Industry FEs	Included	Included
N	4,986	4,986
Adj. R^2	0.14	0.14

Table 4 In-house Tax Investments and Tax Risk

This table reports the regression results on the effect of in-house tax investments on tax risk, using the control function approach to address endogeneity (Column (1)) and using OLS (Column (2)). The sample includes 4,749 firm-years from S&P 1500 firms with available data over the period 2009-2014. *STAGE1_RESIDUAL* is the residuals from the determinant model in Appendix C. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) Control Function *SD_CashETR*	(2) OLS *SD_CashETR*
INHOUSE_TAX_PLANNING	-0.0018	0.0058*
	(-0.47)	(2.03)
INHOUSE_TAX_COMPLIANCE	-0.0160***	-0.0031*
	(-3.85)	(-1.81)
INHOUSE_TAX_GENERAL	-0.0111**	0.0023
	(-2.30)	(1.56)
SIZE	-0.0077***	-0.0058***
	(-6.37)	(-5.58)
ROA	-0.3455***	-0.3404***
	(-14.73)	(-14.62)
MTB	0.0003	0.0002
	(0.84)	(0.68)
LEV	0.0238***	0.0212***
	(3.27)	(2.96)
PPE	0.0011	-0.0017
	(0.12)	(-0.18)
R&D	0.1129***	0.0972**
	(2.62)	(2.28)
INTANG	-0.0481***	-0.0454***
	(-6.98)	(-6.67)
INVENTORY	0.0282*	0.0378**
	(1.87)	(2.10)
NOL	0.0002	-0.0005
	(0.06)	(-0.19)
Δ*NOL*	0.0160	0.0156
	(0.43)	(0.42)
FOR_DUMMY	-0.0096**	-0.0089**
	(-2.97)	(-2.43)
FOR_INCOME	-0.089**	-0.1184***
	(-2.07)	(-2.71)
LN_SEGMENTS	0.0171***	0.0169***
	(5.59)	(5.53)
LN_HAVENS	-0.0012	-0.0012
	(-1.02)	(-1.02)
ICW_DUMMY	0.0036	0.0029
	(0.40)	(0.33)
TAXFEES_DUMMY	-0.0066***	-0.0067**

	(-2.79)	(-2.06)
CashETR3	0.2289***	0.2138***
	(14.39)	(14.41)
SD_PI	0.1272***	0.1154***
	(3.61)	(3.27)
STAGE1_RESIDUAL	0.0131***	
	(2.92)	
Year + Industry FEs	Included	Included
N	4,749	4,749
Adj. R^2	0.31	0.26

Table 5 In-house Tax Investments and Tax Avoidance and Risk: Change Analyses

Panel A: The Overall Change Analyses

This table reports the OLS regression results of changes in tax avoidance and tax risk (from *t*–1 to *t*) on lagged changes in in-house tax investments (*INHOUSE_TAX _PLANNING*, *INHOUSE_TAX _COMPLIANCE*, *INHOUSE_TAX _GENERAL*) (from *t*–2 to *t*–1). See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Δ*CashETR*	Δ*SD_CashETR*
Δ*INHOUSE_TAX_PLANNING*	-0.0473**	0.1138
	(-2.24)	(1.54)
Δ*INHOUSE_TAX_COMPLIANCE*	0.0031	-0.0494
	(0.11)	(-1.14)
Δ*INHOUSE_TAX_GENERAL*	-0.0081*	-0.0112**
	(-1.83)	(-2.41)
Δ*SIZE*	-0.0336**	0.0063
	(-3.78)	(0.53)
Δ*ROA*	-0.1518	-0.1645***
	(-1.37)	(-5.64)
Δ*MTB*	-0.0013	0.0001
	(-1.20)	(0.09)
Δ*LEV*	-0.0134	-0.0029
	(-1.01)	(-0.09)
Δ*PPE*	-0.0661**	-0.0013
	(-3.30)	(-0.09)
Δ*R&D*	-0.1967	0.2060
	(-0.78)	(0.94)
Δ*INTANG*	0.0160*	-0.0043
	(1.82)	(-0.41)
Δ*INVENTORY*	-0.0677**	-0.0428***
	(-4.38)	(-5.11)
Δ*NOL*	0.0131	-0.0319
	(0.14)	(-1.30)
Δ*FOR_DUMMY*	-0.0022	-0.0011
	(-0.25)	(-0.19)
Δ*FOR_INCOME*	-0.2810**	0.0717*
	(-4.29)	(1.81)
Δ*LN_SEGMENTS*	0.0139*	-0.0076
	(1.71)	(-1.15)
Δ*LN_HAVENS*	0.0002	0.0001
	(0.10)	(0.02)
Δ*ICW_DUMMY*	-0.0088	-0.0172
	(-0.57)	(-1.46)
Δ*TAXFEES_DUMMY*	-0.0021	0.0052
	(-0.30)	(0.86)
Δ*CashETR3*		0.0417**

		(3.72)
Δ*SD_PI*		0.0439
		(1.12)
Year + Industry FEs	Included	Included
N	3,418	3,411
Adj. R^2	0.04	0.04

Table 5 (Cont'd)

Panel B: Separating Positive and Negative Changes

This table reports the OLS regression results of changes in tax avoidance and tax risk (from *t*–1 to *t*) on lagged changes in in-house tax investments (*INHOUSE_TAX _PLANNING*, *INHOUSE_TAX _COMPLIANCE*, *INHOUSE_TAX _GENERAL*) (from *t*–2 to *t*–1). We separately examine positive and negative changes in in-house tax investments, as defined below. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Δ^{+}*INHOUSE_TAX_PLANNING* = Δ*INHOUSE_TAX_PLANNING* if Δ*INHOUSE_TAX_PLANNING* is $\geq$ 0, 0 otherwise.

Δ^{-}*INHOUSE_TAX_PLANNING* = Δ*INHOUSE_TAX_PLANNING* if Δ*INHOUSE_TAX_PLANNING* is < 0, 0 otherwise.

Δ^{+}*INHOUSE_TAX_ COMPLIANCE* = Δ*INHOUSE_TAX_ COMPLIANCE* if Δ*INHOUSE_TAX_ COMPLIANCE* is $\geq$ 0, 0 otherwise.

Δ^{-}*INHOUSE_TAX_ COMPLIANCE* = Δ*INHOUSE_TAX_ COMPLIANCE* if Δ*INHOUSE_TAX_ COMPLIANCE* is < 0, 0 otherwise.

Δ^{+}*INHOUSE_TAX_GENERAL* = Δ*INHOUSE_TAX_GENERAL* if Δ*INHOUSE_TAX_GENERAL* is $\geq$ 0, 0 otherwise.

Δ^{-}*INHOUSE_TAX_GENERAL* = Δ*INHOUSE_TAX_GENERAL* if Δ*INHOUSE_TAX_GENERAL* is < 0, 0 otherwise.

	(1) Δ*CashETR*	(2) Δ*SD_CashETR*
Δ^{+}*INHOUSE_TAX_PLANNING*	-0.1133**	0.0677
	(-2.12)	(1.23)
Δ^{-}*INHOUSE_TAX_PLANNING*	-0.0031	0.2008*
	(-0.09)	(1.76)
Δ^{+}*INHOUSE_TAX_COMPLIANCE*	-0.0594	-0.1175*
	(-0.50)	(-1.68)
Δ^{-}*INHOUSE_TAX_COMPLIANCE*	0.0649	0.0493
	(0.69)	(0.49)
Δ^{+}*INHOUSE_TAX_GENERAL*	-0.0148	-0.0121*
	(-1.31)	(-1.86)
Δ^{-}*INHOUSE_TAX_GENERAL*	-0.0048	-0.0017
	(-0.32)	(-1.00)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	3,418	3,411
Adj. R^2	0.04	0.03

Table 6 In-house Tax Investments versus Auditor-Provided Tax Services

This table reports the regression results on the interaction effects of in-house tax investments and auditor-provided tax services, using the control function approach to address endogeneity. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	CashETR3	*SD_CashETR*
INHOUSE_TAX_PLANNING	-0.0241**	0.0018
	(-2.39)	(0.27)
INHOUSE_TAX_PLANNING × *TAXFEES_DUMMY*	0.0131	-0.0090
	(0.94)	(-0.73)
INHOUSE_TAX_COMPLIANCE	0.0189	-0.0235***
	(0.82)	(-4.06)
INHOUSE_TAX_COMPLIANCE × *TAXFEES_DUMMY*	-0.0039	0.0149**
	(-0.16)	(2.39)
INHOUSE_TAX_GENERAL	-0.0217***	-0.0220***
	(-3.59)	(-3.49)
INHOUSE_TAX_GENERAL × *TAXFEES_DUMMY*	0.0143***	0.0106***
	(3.13)	(3.74)
TAXFEES_DUMMY	0.0042	-0.0172***
	(0.69)	(-3.55)
Control Variables	Included	Included
Year + Industry FEs	Included	Included
N	4,986	4,749
Adj. R^2	0.19	0.31

Table 7 The Conditional Effect of Prior Tax Avoidance and Tax Risk

This table reports the OLS regression results of the changes in tax avoidance and tax risk (from *t*–1 to *t*) on lagged changes in in-house tax investments (*INHOUSE_TAX _PLANNING*, *INHOUSE_TAX _COMPLIANCE*, *INHOUSE_TAX _GENERAL*) (from *t*–2 to *t*–1), conditional on firms' prior tax avoidance and tax risk level relative to industry peers (in year t-2). *HIGH_CashETR* is an indicator variable that equals 1 if the firm's *CashETR* is higher than the average *CashETR* of industry peers in year *t–2*. *HIGH_SD_CashETR* is an indicator variable that equals 1 if the firm's *SD_CashETR* is higher than the average *SD_CashETR* of industry peers in year t–2. The industry peers include firms with similar size in the same industry, following Balakrishman, Blouin, and Guay (2012). See Appendix B for the definitions of other variables. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Prior Tax Avoidance

	Δ*CashETR*
Δ*INHOUSE_TAX_PLANNING*	-0.0363**
	(-2.01)
Δ*INHOUSE_TAX_PLANNING* × *HIGH_CashETR*	-0.1350***
	(-2.83)
Δ*INHOUSE_TAX_COMPLIANCE*	-0.0295
	(-0.60)
Δ*INHOUSE_TAX_COMPLIANCE* × *HIGH_CashETR*	-0.0546
	(-0.39)
Δ*INHOUSE_TAX_GENERAL*	0.0035
	(0.48)
Δ*INHOUSE_TAX_GENERAL* × *HIGH_CashETR*	-0.0396***
	(-4.98)
Control Variables	Included
Year + Industry FEs	Included
N	3,418
Adj. R^2	0.17

Table 7 (Cont'd)

Panel B: Prior Tax Risk

	Δ*SD_CashETR*
Δ*INHOUSE_TAX_PLANNING*	0.0759
	(1.29)
Δ*INHOUSE_TAX_PLANNING* × *HIGH_SD_CashETR*	0.2037
	(0.85)
Δ*INHOUSE_TAX_COMPLIANCE*	0.0306
	(0.87)
Δ*INHOUSE_TAX_COMPLIANCE* × *HIGH_SD_CashETR*	-0.3502*
	(-2.26)
Δ*INHOUSE_TAX_GENERAL*	-0.0125*
	(-2.17)
Δ*INHOUSE_TAX_GENERAL* × *HIGH_SD_CashETR*	0.0066
	(0.73)
Control Variables	Included
Year + Industry FEs	Included
N	3,411
Adj. R^2	0.08

Table 8 Overall In-house Tax Investments and Tax Avoidance and Risk

This table reports the results for the overall tax investments (*INHOUSE_TAX*). Column (1) and (2) report the level regressions using the control function approach to address endogeneity. Column (3) and (4) report the change regressions using OLS. Column (5) and (6) separately test the effect of positive and negative changes, as defined below, using OLS. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Δ^{+}*INHOUSE_TAX* = Δ*INHOUSE_TAX* if Δ*INHOUSE_TAX* is ≥ 0, 0 otherwise.

Δ^{-}*INHOUSE_TAX* = Δ*INHOUSE_TAX* if Δ*INHOUSE_TAX* is < 0, 0 otherwise.

	Level Regressions		Change Regressions			
	(1)	(2)	(3)	(4)	(5)	(6)
	CashETR3	*SD_CashETR*	Δ*CashETR*	Δ*SD_CashETR*	Δ*CashETR*	Δ*SD_CashETR*
INHOUSE_TAX	-0.0104**	-0.0210**				
	(-2.50)	(-2.21)				
Δ *INHOUSE_TAX*			-0.0109**	-0.0079**		
			(-2.20)	(-3.33)		
Δ^{+}*INHOUSE_TAX*					-0.0176**	-0.0105***
					(-2.07)	(-3.90)
Δ^{-}*INHOUSE_TAX*					0.0001	-0.0037
					(0.12)	(-0.55)
Control Variables	Included	Included	Included	Included	Included	Included
Year+Industry FEs	Included	Included	Included	Included	Included	Included
N	4,986	4,749	3,418	3,411	3,418	3,411
Adj. R^2	0.13	0.26	0.04	0.11	0.05	0.11

Table 9 Incremental Effect of External Experiences of In-house Tax Employees on Tax Avoidance and Tax Risk

This table reports the regression results on the incremental effects of in-house tax employees' external work experiences on tax avoidance and tax risk, using the control function approach to address endogeneity. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	CashETR3	*SD_CashETR*	*CashETR3*	*SD_CashETR*
INHOUSE_TAX	-0.0091**	-0.0197**	-0.0091**	-0.0206**
	(-2.11)	(-2.06)	(-2.07)	(-2.17)
INHOUSE_TAX_EXTERNAL	-0.0079**	-0.0020		
	(-2.33)	(-1.12)		
INHOUSE_TAX_BIGN			-0.0075*	-0.0006***
			(-1.78)	(-2.75)
INHOUSE_TAX_CPAFIRM			-0.0222*	-0.0015
			(-1.87)	(-0.19)
INHOUSE_TAX_LAWFIRM			0.0025	-0.0170***
			(0.22)	(-3.62)
INHOUSE_TAX_FINANCIAL			-0.0379	0.0140
			(-1.49)	(0.97)
Control Variables	Included	Included	Included	Included
Year + Industry FEs	Included	Included	Included	Included
N	4,986	4,749	4,986	4,749
Adj. R^2	0.12	0.26	0.12	0.26

Table 10 Sensitivity Tests

Panel A: Additional Control Variables and the IV Approach

This table reports results of robustness checks using the overall in-house tax investments *INHOUSE_TAX*. Columns (1) and (2) are based on the control function approach with additional control variables. Columns (3) and (4) are based on the IV approach; *INHOUSE_TAX* is the predicted value estimated from the determinant model. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The additional control variables are defined below:

LN_AGE	=	Firm age, measured as the natural logarithm of the number of years between the first year when the firm appeared in *Compustat* and 2015.
SALES_GROWTH	=	Average sales growth over three years. Source: *Compustat*.
ADVERTISTING	=	Average advertising expenses over three years divided by average lagged assets over the same period. Source: *Compustat*.
EQUITY_EARNINGS	=	Average equity in earnings over three years divided by average lagged assets over the same period. Source: *Compustat*.
MINORITY_INTERESTS	=	Average minority interests' earnings over three years divided by average lagged assets over the same period. Source: *Compustat*.
OPTION_TAX_BENEFITS	=	Estimated option tax benefits, per Gleason and Mills (2011), [(Average stock price for the year – Average exercise price) × number of share exercised × 0.35]. If the average exercise price is higher than the average stock price for the year, we use the maximum stock price for the year in place of the average stock price. Missing or negative *OPTION_TAX_BENEFITS* is set as zero.

	Additional Control Variables		IV Approach	
	(1)	(2)	(3)	(4)
	CashETR3	*SD_CashETR*	*CashETR3*	*SD_CashETR*
INHOUSE_TAX	-0.0106**	-0.0205**	-0.0195**	-0.0166***
	(-2.51)	(-2.12)	(-2.49)	(-3.38)
LN_AGE	-0.0027	-0.0078*		
	(-0.42)	(-1.75)		
SALES_GROWTH	-0.0196	0.0042		
	(-0.89)	(0.48)		
ADVERTISTING	0.1597***	-0.0132		
	(2.74)	(-0.37)		
EQUITY_EARNINGS	-0.5887	0.2105		
	(-1.18)	(0.70)		
MINORITY_INTERESTS	1.6265**	0.6151**		
	(2.32)	(1.97)		
OPTION_TAX_BENEFITS	-0.0063**	-0.0065*		
	(-2.47)	(-1.71)		
Control Variables	Included	Included	Included	Included
Year + Industry FEs	Included	Included	Included	Included
N	4,986	4,749	4,986	4,749
Adj. R^2	0.13	0.26	0.11	0.17

Table 10 (Cont'd)

Panel B: Alternative Proxies for Tax Avoidance and Tax Risk

This table reports results using alternative proxies for tax avoidance and tax risk, using the control function approach. See Appendix B for variable definitions. Intercepts are included but not tabulated. The t-statistics (in parentheses) are based on heteroskedasticity-consistent standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The alternative proxies are defined below:

AdjCashETR3 = Industry-size-adjusted *CashETR3*, defined as the firm's *CashETR3* less the average *CashETR3* of firms with similar size in the same industry, per Balakrishnan, Blouin, and Guay (2012). Source: *Compustat*.

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. Source: *Compustat*.

AdjSD_CashETR = Industry-size-adjusted *SD_CashETR*, defined as the firm's *SD_CashETR* less the average *SD_CashETR* of firms with similar size in the same industry, per Balakrishnan, Blouin, and Guay (2012). Source: *Compustat*.

SD_GAAP_ETR = Standard deviation of annual GAAP ETR over three years. Source: *Compustat*.

	Alternative Tax Avoidance Proxies		Alternative Tax Risk Proxies	
	(1)	(2)	(3)	(4)
	AdjCashETR3	*GAAP_ETR3*	*AdjSD_CashETR*	*SD_GAAP_ETR*
INHOUSE_TAX	-0.0053**	-0.0058**	-0.0081**	-0.0016***
	(-2.98)	(-2.20)	(-2.31)	(-3.52)
Controls Variables	Included	Included	Included	Included
Year + Industry FEs	Included	Included	Included	Included
N	4,673	4,866	4,430	4,631
Adj. R^2	0.19	0.17	0.27	0.16