Tax Avoidance and Corporate Investment Behavior:
The Role of the Information Environment

Current Draft: November 2016

Joseph Comprix
Syracuse University
jjcompri@syr.edu

Joohyung Ha
University of San Francisco
jha6@usfca.edu

Mingming Feng
Western Michigan University
mingming.feng@wmich.edu

Tony Kang
McMaster University
kangt@mcmaster.ca

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Abstract

We investigate whether tax avoidance is associated with greater investment and overinvestment. We further test whether the firm's information environment moderates this association. We find that tax avoidance is associated with more efficient investment behavior when the firm's information environment is richer. Our results are robust across multiple measures of tax avoidance and multiple proxies for the quality of the information environment. These findings highlight the important role of financial information in corporate investment decisions and enhance our understanding of the link between tax avoidance and agency costs.

1. Introduction

This study addresses two complementary research questions. First, given that tax avoidance frees up cash, how will it affect a firm's investment behavior? In particular, do firms overinvest using tax cash savings and to what extent is tax avoidance associated with overinvestment. Second, in light of the monitoring role of the information environment on corporate investment decisions (*e.g.*, Biddle and Hilary, 2006), does the quality of the information environment, operationalized using financial reporting quality and analyst forecast attributes, moderate the association between tax avoidance and investment/overinvestment?

Although tax savings are typically viewed as a transfer of wealth from the government to shareholders, prior studies show that tax savings may not fully transfer to shareholders due to rent extraction through complicated business structures, among other reasons (Desai and Dharmapala, 2009a, 2009b). In this paper, we conjecture that a reason why corporate tax avoidance may not fully benefit shareholders is due to inefficient investment behavior. Unlike prior studies which focus on Tobin's Q to detect rent extraction (Desai and Dharmapala, 2009a, 2009b; Blaylock, 2016), we focus on investment behavior, which is a more direct measure than Tobin's Q to detect rent extraction as it captures managers' own actions rather than the perception of outside shareholders.

Jensen's free cash flow hypothesis (1986) states that managers have a tendency to invest more than is optimal for the firm for personal gain at the expense of shareholders when monitoring mechanisms are weak. Tax savings are often substantial and represent potential resources that can facilitate empire building. Therefore, in light of the free cash flow hypothesis (1986), tax savings are more likely to be wasted in the absence of effective monitoring devices. At the same time, an extensive literature documents the monitoring role of the corporate information environment in

mitigating managerial opportunism and suboptimal investment decisions (Bushman and Smith, 2001; Biddle *et al*., 2009; Armstrong *et al*., 2010; Beatty *et al*., 2010; Shroff *et al*., 2014). A firm's information environment depends both on internally generated financial reports and on disclosures and information provided by the firm's information intermediaries. Shareholders can use information provided by both the corporation and by external parties to evaluate and monitor managerial behavior. However, the role of a firm's information environment in constraining the ability of a manager to extract rent in a tax avoidance context has not been documented previously. This study fills this void in the literature and responds to the call for more research on tax avoidance in the agency framework (Scholes *et al*., 2005; Desai and Dharmapala, 2009a).

As Hanlon and Heitzman (2010) note, tax avoidance can occur through complex tax strategies such as transfer pricing, sheltering, mergers and acquisition, and compensation, among others. Theory suggests that self-interested managers deliberately structure transactions in a complex manner to reduce corporate taxes and divert corporate resources for private use (Desai *et al*., 2007). Desai and Dharmarpala (2009a) posit that well-governed firms are more likely to have internal control mechanisms that deter managerial diversion of firm resources, and claim that managers' equity incentives will reduce tax avoidance behavior only in well-governed firms. Empirical evidence does not strictly support this prediction. Armstrong *et al*. (2015) find no relationship between various internal corporate governance mechanisms and tax avoidance. Similarly, Blaylock (2016) explores whether tax avoidance is linked to managerial rent extraction and how this link is affected by corporate governance. He does not find convincing evidence that firms with weak corporate governance, whose tax avoidance is more likely to represent rent extraction, make less efficient investment decisions.

However, Armstrong *et al.* (2012a) suggest that examining a firm's internal governance mechanisms separately does not provide a complete picture of the firm's governance environment, as its information environment is a critical part of the governance. Thus, we recognize that a firm's tax planning strategy, corporate governance, and information environment are likely to be jointly determined and are intertwined in a rather complex manner (Desai and Dharmapala, 2009b; Balakrishnan *et al.*, 2012). For instance, agency problems due to the separation of ownership and control can affect not only a manager's tax strategy but also the design of incentive contracts and firm disclosure strategy. Further, since tax planning often involves complex structuring of transactions, it can increase both the operational and informational complexity of the firm. Thus, by conditioning on the quality of the firm's information environment, while controlling for the strength of its internal governance mechanisms, one is likely to gain a deeper understanding of whether tax avoidance is associated with managerial rent extraction.

In this study, we characterize tax avoidance as a firm's action of paying lower tax than its peers, *i.e.*, firms of similar size in the same industry. We use two primary measures of tax avoidance - three-year cash effective tax rates (CETRs) and three-year GAAP effective tax rates (GAAPETRs) (Balakrishnan *et al.*, 2012). We define a firm's information environment as the availability and quality of information available through financial statements and information intermediaries, and operationalize it using tests of financial reporting quality and analyst forecast measures. Specifically, we employ two measures of the information environment – an internal measure based on the firm's financial reporting quality and an external one derived from analyst forecast properties. The first measure is extracted from three financial reporting quality proxies, *i.e.*, performance-matched discretionary accruals, discretionary working capital accruals, and discretionary revenues (Chen *et al.*, 2011), and the second measure is a composite measure of three

analyst variables, *i.e.*, analyst coverage, forecast errors and forecast dispersion. These proxies are intended to capture the quality of information provided by a firm and its information intermediaries.

We examine the moderating role of the information environment in how a firm's investment behavior – both the total amount of investment and the amount of investment *vis-à-vis* a firm's *ex-ante* likelihood of overinvestment – varies with tax avoidance. A higher quality information environment can deter opportunistic managerial behavior by increasing transparency (thus increasing the likelihood of detection and sanctions) and by facilitating more efficient contracting to prevent value-destroying corporate decisions (Jensen and Meckling, 1976). In our sample, tax avoidance is positively associated with both overall investment and overinvestment, but having a richer information environment mitigates these relationships. These results hold even after controlling for corporate governance mechanisms, highlighting the unique role of the information environment on investment behavior in the presence of tax avoidance.

This study contributes to the literature in several ways. First, our study contributes to the stream of literature that examines the relation between corporate tax planning and firm value by identifying a potential link between corporate tax avoidance and firm value creation. To the extent that tax avoidance results in substantial cash tax savings (Dyreng *et al*., 2008), a manager can either misuse it or engage in value-creating activities. Our results suggest that a manager in a firm with greater informational transparency can use the cash savings from tax planning to make better investment decisions. Second, this study extends the literature on how a firm's information environment affects its investment behavior (Hope and Thomas, 2008; McNichols and Stubben, 2008; Biddle *et al*., 2009; Shroff *et al*., 2014). We contribute to this line of research by documenting the disciplining role of the firm's information environment in limiting potential agency costs associated with the complex nature of a firm's tax planning and its investments. Third,

this study advances our understanding of the relationship between corporate governance and managerial rent extraction in the context of tax avoidance. Armstrong *et al*. (2012a) argue that a firm's information environment is a crucial input when designing corporate governance mechanisms to reduce the information asymmetry between shareholders and managers. In line with this intuition, by jointly considering a firm's internal governance mechanisms and its information environment on the value-enhancing role of potential cash tax savings, this study helps us better understand the complex relationship between corporate governance and managerial rent extraction from aggressive corporate tax strategies.

This paper proceeds as follows. Section 2 summarizes the prior literature. Section 3 develops the hypotheses. Section 4 describes the research design. Section 5 presents the findings. Section 6 concludes and discusses some implications for stakeholders.

2. Literature Review

Prior research documents a variety of firm characteristics as the determinants of tax avoidance. Gupta and Newberry (1997) find that effective tax rates are positively associated with leverage and capital intensity, and negatively associated with firm profitability. Rego (2003) finds that multinational corporations with more foreign operations have lower effective tax rates. Recent studies find that firms using tax shelters tend to be more profitable, have greater foreign operations, more research and development expenditures, and have less leverage (Graham and Tucker, 2006; Wilson, 2009; Lisowsky, 2010).

In addition, some studies' findings are consistent with managerial risk-taking incentives being an important determinant of tax avoidance. Hanlon *et al*. (2007), Rego and Wilson (2012) and Armstrong *et al*. (2015) find that firms in which managers have high risk-taking equity

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incentives engage in more tax avoidance. Minnick and Noga (2010) find that the pay-performance sensitivities of both CEOs and board directors are positively associated with tax avoidance (reflected in lower long-term CETRs and GAAPETRs). Chyz (2013) finds that executives who exhibit a propensity for personal tax evasion are associated with tax sheltering at the firm level. Further, an emerging literature suggests that overconfident and risk-taking managers tend to engage in tax avoidance (Rego and Wilson, 2012; Chyz *et al.*, 2015; Armstrong *et al.*, 2015).[1] Finally, Dyreng *et al.* (2010) find that managerial fixed effects are significantly associated with a firm's tax avoidance, while common individual characteristics, such as education, gender and age, cannot explain this variation.

Slemrod (2004) acknowledges the need to analyze the dynamics of tax avoiding activities in the light of agency problems inherent in corporations. The agency literature argues that tax avoidance may not be desired by shareholders because the marginal costs of tax avoidance may outweigh the marginal benefits.[2] Consistent with this view, some studies have found that strong corporate governance mitigates the incentives to engage in tax avoidance. For example, consistent with tax sheltering facilitating rent extraction in poorly-governed firms, Desai and Dhalmapala (2006) find that the increases in the alignment of shareholder and manager interests induce the manager to reduce the level of tax avoidance among poorly-governed firms. Desai and Dharmapala (2009a) also find that the effect of tax avoidance on firm value is more positive for well-governed firms. Kim *et al.* (2011) find that corporate tax avoidance is strongly associated with firm-specific stock price crash risk, consistent with the argument that tax avoidance introduces opacity by facilitating the hoarding and

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[1] Overconfidence can be a desirable quality of managers when there are value-increasing but highly risky investment opportunities. The downside of overconfidence is that it may lead to false assessments of investment value and risk, resulting in suboptimal decision-making.

[2] The marginal benefits of tax avoidance are substantial tax savings, whereas the marginal costs are the direct costs including IRS audit risk and potential fines as well as the indirect costs such as reputational penalties and corporate opacity generated by the use of complicated transactions to achieve a lower tax expense.

accumulation of bad news. They also find that effective governance mechanisms (such as institutional ownership and analyst coverage) mitigate the crash risks associated with tax avoidance. Chen *et al*. (2010) find that family firms engages in less tax avoidance than non-family firms, and argue that family firms forgo tax benefits to mitigate the concerns of minority shareholders who may view tax avoidance as masking possible family rent-seeking.

In contrast, some studies find that corporate governance is not associated with reductions in tax avoidance. For example, Goh *et al*. (2016) find a positive association between tax avoidance and the likelihood that an auditor resigns from an audit engagement when external monitoring of the client firm is more effective. Examining whether managers of tax-avoiding firms engage in rent extraction, Blaylock (2016) demonstrates a positive relationship between tax avoidance and future firm performance regardless of the level of corporate governance among U.S. firms, thus failing to provide evidence that agency problems could be a concern for tax avoidance.[3]

In addition, some studies focus on the negative impact of tax avoidance on a firm's information environment. For example, Desai and Dharmapala (2009a) suggest that complex tax transactions that conceal income from the government may prevent investors from monitoring managerial extraction of corporate resources. Desai and Dharmapala (2009b), Armstrong *et al*. (2012b) and Balakrishnan *et al*. (2012) argue that tax avoidance can impair information transparency and exacerbate agency conflicts between managers and shareholders, whereby managers may attempt to obfuscate tax strategies to facilitate rent extraction. Frank *et al*. (2009) document that tax aggressiveness is associated with greater earnings management. Similarly, Lennox *et al*. (2013) argue that tax aggressiveness under the guise of lowering corporate taxes can

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[3] Although Katz *et al*. (2013) find that tax avoidance moderates the association between current and future profits, primarily due to the lower operating margins of tax-avoiding firms.

provide self-dealing managers opportunities to manipulate earnings. Hope *et al*. (2013) find that firms are reluctant to disclose tax-related information because a failure to disclose can be a tool used by managers to mask their firms' tax avoidance. In addition, Wang (2012) finds evidence that the valuation premium for tax avoidance is greater for informationally transparent firms, suggesting that greater corporate transparency plays a monitoring role over managerial opportunism, which alleviate investors' concerns about the agency costs associated with tax avoidance.

More recently, Gallemore and Labro (2015) examine the role of the internal information environment on tax avoidance outcomes. Based on decision theory, they argue that without good information, tax-reducing opportunities might be overlooked. Coordination of tax planning across internal divisions might be poor, tax documents might be lacking supporting facts, and tax risk might be higher, all contributing to poor tax outcomes. They find that a rich internal information environment allows firms to engage in more tax avoidance while decreasing a firm's tax risk.[4] Our study is closely related to but different from Gallemore and Labro (2015) in that (1) we focus on the role of the information environment to reduce information asymmetry between managers and shareholders, while they focus on the role of the information environment to alleviate information asymmetry within a firm; and that (2) we explore the effect of the information environment on one specific tax avoidance outcome, investment efficiency, while they focus on tax risk.

3. Hypothesis Development

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[4] A rich internal information environment is characterized by high accessibility, usefulness, reliability, accuracy, quantity, and signal-to-noise ratio of the data and knowledge collected, generated, and consumed within an organization (Gallemore and Labro, 2015).

Consistent with tax avoidance resulting in significantly increased after-tax cash flows, Lisowsky *et al*. (2013) find that the reportable transactions of 48 firms reduce taxable income in 2007 by $10.7 billion, or 7.5%, representing tax savings of $3.7 billion. Indeed, there is evidence that firms view tax planning as a source of financing. For example, Edwards *et al*. (2016) find that firms facing financial constraints will take actions to increase internally generated funds via tax planning strategies that reduce firms' cash tax payments.

Although cash savings achieved through tax planning can be viewed as a potential source of financing and can be expected to benefit firms, they can exacerbate agency problems (moral hazard) by facilitating managerial rent extraction in the form of overinvestment if the manager exploits the complex nature of tax planning to extract rents (Desai and Dhalmapala, 2009b). The free cash flow hypothesis states that firms with excess funds are more likely to make suboptimal investment decisions and suggests that tax savings will translate into greater benefits to shareholders when proper monitoring mechanisms are in place to deter managerial rent extraction (Myers, 1977; Jensen, 1986).

Consistent with the free cash flow hypothesis, extant research finds that larger free cash leads to more severe agency problems in the form of overinvestment. For example, Harford (1999) finds that cash-rich firms are more likely to make value-destroying acquisitions. Further, he finds that the market reaction to the announcement of a takeover bid is negatively associated with the amount of the excess cash holdings of the bidder. Opler *et al*. (1999) find that firms with excess cash tend to spend more on capital expenditures and acquisitions even when they have poor investment opportunities. Richardson (2006) examines firm level overinvestment of free cash flows, and finds that overinvestment is concentrated in firms with the highest levels of free cash flow. Dhaliwal *et al*. (2011) find that investor valuation of firm cash holdings is lower for firms

with higher levels of tax avoidance, consistent with the argument that tax avoidance may not be beneficial to the interests of shareholders due to agency concerns.

We first test whether tax avoidance is associated with greater investment levels, then further explore whether tax-avoiding firms are likely to deviate from their predicted level of investment to confirm whether agency costs are associated with tax avoidance. To the extent that tax avoidance is associated with the firm's underlying agency problems, managers are more likely to extract rents from the cash savings, and one possible suboptimal corporate decision the manager might make is overinvestment.[5] This leads us to predict the following:

H1a: Tax avoidance is associated with greater investment.

H1b: Tax avoidance is associated with overinvestment.

Managers will find it more costly to extract rents through complex tax strategies (the opportunistic rent extraction effects) in a richer information environment where they will be under greater scrutiny and hence the likelihood of detection is higher. Given the monitoring role of the information environment in mitigating managerial opportunism and potential distortions in investment decisions (Bushman and Smith, 2001; Biddle *et al.*, 2009; Beatty *et al.*, 2010; Shroff *et al.*, 2014), a firm's information environment can deter managers from extracting rents from tax avoidance.

Given the monitoring role of financial information, we expect the extent to which tax avoidance relates to investment efficiency to vary with the firm's information environment. Bushman and Smith (2001) note that high quality financial information helps managers identify positive NPV projects and also disciplines managers' project selections. While a firm's

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[5] Free cash flow is defined as internally generated cash flow in excess of what is required to maintain assets in place and to fund new positive NPV projects. Managers have shown a tendency to waste excess cash and capital on low return projects like diversifying acquisitions and misguided efforts to build market share in shrinking industries.

information environment is influenced by many factors, we focus on two aspects of a firm's information environment that have been shown to explain managerial rent extraction behavior – financial reporting quality and financial analysts' earnings forecasts.

A firm's financial accounting information is an important component of the firm's corporate governance that summarizes the control and use of resources by those accountable for their control and use (Rosenfield, 1974). More specifically, prior studies document that a firm's financial reporting quality relates to its investment behavior (Biddle and Hilary, 2006; Biddle *et al*., 2006). Biddle *et al*. (2009) suggest that higher financial reporting quality (FRQ) can curb managerial incentives to engage in value destroying overinvestments by disciplining them. They also argue that higher financial reporting quality can alleviate the underinvestment problem by allowing constrained firms to attract capital by making their positive net present value (NPV) projects more visible to investors and by reducing adverse selection in stock issuance. Thus, when a firm's FRQ is higher, the manager is more likely to use the cash tax savings to improve shareholder wealth by making better investment decisions - either by discontinuing its investments in unprofitable projects or by taking on more positive NPV projects. This line of reasoning leads us to formulate the following FRQ hypothesis:

H2a: *As a firm's financial reporting quality increases, tax avoidance is less likely to be associated with overinvestment.*

Financial analysts are important information intermediaries between the firm and its investors, and are considered primary users of financial statements (Schipper, 1991; Healy and Palepu, 1999). They collect and process publicly available information and also generate private information through their own information search activities. They track firms' financial information regularly, often interact directly with management and raise questions about different aspects of financial reporting, serving as external monitors of corporate managers (Jensen and

Meckling, 1976; Healy and Palepu, 2001). Such analyst monitoring can make it more difficult for managers to conceal and divert cash from aggressive tax planning to pursue the benefits of private control. Rather, with cash tax savings, they are more likely to engage in corporate activities that enhance shareholder wealth such as investing more efficiently, *i.e.*, investing less (more) in negative (positive) NPV projects. Financial analysts are likely to be more effective monitors of the firm when more analysts follow the firm, when they engage in private information search activities that lead to more accurate earnings forecasts, and when they produce more consistent forecasts among them, *i.e.*, when forecast dispersion is low. Following this chain of reasoning, we develop our analyst hypothesis as follows:

H2b: *In the presence of effective analyst monitoring, tax avoidance is less likely to be associated with overinvestment.*

4.   Research Methodology

4.1 Measures of the Quality of the Information Environment (*Inf*)

We use two composite measures of the quality of the information environment (*Inf*).[6] The first composite measure (*Inf_FRQ*) is constructed using three financial reporting quality variables (*PerfDA*, *DisWCA* and *DisRev*). Accrual quality can alleviate information frictions and restrain managers' inefficient investment behaviors. We employ the absolute value of performance-matched discretionary accruals (*PerfDA*) (Kothari *et al.*, 2005), discretionary working capital accruals (*DisWCA*), and discretionary revenues (*DisRev*) (Chen *et al.*, 2011). Details on calculating these three measures are discussed in *Appendix* B. These three variables are multiplied by negative one so that greater values represent better quality of financial reporting and the information environment. *Inf_FRQ* is the aggregate measure of the three financial reporting quality variables

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[6] Results using each measure of the quality of the information environment individually are generally the same.

(*PerfDA*, *DisWCA* and *DisRev*) and is calculated by summing the percentile ranks of these three variables.

The second composite measure (*Inf_ANA*) is constructed using three analyst forecast variables (*Coverage*, *FE* and *Dispersion*).[7] Analyst Coverage (*Coverage*) is the number of analysts following a firm. Forecast Errors (*FE*) is the absolute value of the forecast earnings per share (EPS) minus the actual EPS, deflated by the stock price at the beginning of the year, where forecast EPS is the most recent figure prior to the announcement date of the year but subsequent to the previous EPS announcement. Forecast Dispersion (*Dispersion*) is the standard deviation of the forecast EPS of the year, deflated by the stock price at the beginning of the year. We multiply *FE* and *Dispersion* by minus one so that greater values of these measures represent better quality of the information environment. *Inf_ANA* is the aggregate measure of the three analyst forecast variables (*Coverage*, *FE* and *Dispersion*) after summing the percentile ranks of these three variables.

4.2 Primary Measures of Tax Avoidance (*TaxAvoid*)

We use two primary measures of tax avoidance. Following Dyreng *et al*. (2008) and Hope *et al*. (2013), our first measure is the three-year average of cash effective tax rates, *CETR*, calculated as the sum of a firm's total cash taxes paid from year *t-2* to *t* scaled by the sum of its total pretax income before special items over the same period. Our second measure is the three-year average of traditional accrual-based effective tax rates, *GAAPETR*, calculated as the sum of a firm's total income tax expense from year *t-2* to *t* scaled by the sum of its pre-tax book income before special items over the same period. Following Balakrishnan *et al*. (2012), we then adjust each *CETR* (*GAAPETR*) by the same period's *CETR* (*GAAPETR*) for the portfolio of firms in the same quintile of total assets and the same industry, where size and industry are sorted

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[7] Results using these three analyst forecast measures individually are generally the same.

independently and industry is based on the 48 industries defined by Fama and French (1997). We multiply the industry-size adjusted *CETR* and *GAAPETR* by negative one so that greater values for both measures represent firms that pay less tax than their size-industry peers. We refer to the industry-size adjusted cash effective tax rate as *CETR* and to the industry-size adjusted effective tax rate as *GAAPETR*.

Other than the two primary measures (*CETR* and *GAAPETR*), we also use three alternative measures of tax avoidance (discretionary permanent book-tax differences, a tax shelter prediction score, and unrecognized tax benefits) in robustness tests. The descriptions and results of these three alternative measures are discussed in Section 5.4.1.

4.3 Research Design on Tax Avoidance and Investment Efficiency

To test our hypotheses, we conduct our analyses in two steps. First, we examine whether firms employing more tax avoidance invest more than their counterparts, and how the relationship between tax avoidance and investment levels varies depending on the quality of the information environment (measured by the quality of financial reporting and the informativeness of analyst forecasts). Second, we examine the relationship between the effectiveness of the information environment and investment levels conditional on the propensity of overinvestment.

4.3.1 Unconditional Analysis on the Investment Level

Similar to García Lara *et al*. (2016) who test the relationship between conservatism and investment efficiency conditional on the level of information asymmetry, we examine the cross-sectional variation in the relationship between investment levels and tax avoidance depending on the quality of the information environment by estimating the following Model (1).

$Invest_{i,t} = \beta_0 + \beta_1 TaxAvoid_{i,t-1} + \beta_2 Inf_{i,t-1} + \beta_3 TaxAvoid*Inf_{i,t-1} + \beta_4 Cash_{i,t} + \beta_5 MtB_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Leverage_{i,t} + \beta_8 Dividend_{i,t} + \beta_9 Size_{i,t} + \beta_{10} StdSales_{i,t} + \beta_{11} StdSales_{i,t} + \beta_{12} StdInv_{i,t} + \beta_{13} StdROA_{i,t} + \beta_{14} InstiOwn_{i,t} + \beta_{15} Inf*Cash_{i,t} + \beta_{16} Inf*MtB_{i,t} + \beta_{17} Inf*ROA_{i,t} + \beta_{18} Inf*Leverage_{i,t} + \beta_{19} Inf*Dividend_{i,t} + \beta_{20} Inf*Size_{i,t} + \beta_{21} Inf*StdSales_{i,t} +$

$$+\beta_{21}Inf*StdSales_{i,t}+\beta_{23}Inf*StdInv_{i,t}+\beta_{24}Inf*StdROA_{i,t}+\beta_{25}Inf*InstiOwn_{i,t}$$
$$+\Sigma Industry_i+\Sigma Year_t+\varepsilon_{i,t} \quad\quad\quad (1)$$

To observe managerial investment policies followed by more tax avoidance, we use the dependent variable (*Invest*), which is the sum of research and development expenditures, capital expenditures and acquisition expenditures less cash receipts from the sale of property, plant, and equipment, all scaled by lagged total assets. *TaxAvoid* represents *CETR* or *GAAPETR*, measured as lagged values to reflect the time lag for tax savings to be invested. *Inf* represents *Inf_FRQ* or *Inf_ANA*.

Biddle *et al*. (2009) document that investment efficiency is positively associated with institutional ownership and negatively associated with the effectiveness of the market for corporate control. They fail to find a significant relationship between analyst coverage and investment efficiency. To ensure that the effect we document is due to the quality of the information environment rather than other corporate governance mechanisms, we include one corporate governance control variable, institutional ownership (*InstiOwn*), and its interaction terms along with information environment variables (*Inf*) in the model (Biddle *et al*., 2009).[8]

A number of control variables are included in the model. First, we include four variables to capture the impact of financial constraints on investment activities (Asker *et al*., 2012). Firms with more cash holdings (*Cash*), more assets (*Size*), greater return on assets (*ROA*), and with lower leverage (*Leverage*) tend to have fewer financial constraints and can easily take advantage of investment opportunities. We expect *ROA* and *Cash* to be positively associated with investment and *Leverage* and *Size* to be negatively associated with investment (*Invest*). We further include controls for sales volatility (*stdSales*), investment volatility (*stdInvest*), and the volatility of return

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[8] As a robustness check, we also use G-index of anti-takeover provisions (*G*) as another control variable of corporate governance. The results are discussed in Section 5.4.4.

on assets (*stdROA*), which can simultaneously affect both the information environment and the cost of capital, and thus investment behavior (Biddle *et al*., 2009). These variables are measured as the standard deviation of sales, investment, and market-adjusted monthly stock returns during the past four years, respectively. Finally, we control for the market to book ratio (*MtB*) and the dividend payout ratio (*Dividend*) since both have been found to affect investment behavior (Biddle *et al.*, 2009). The interactions of the control variables and *Inf* variables are also included. Industry and year fixed effects are included to capture industry and time specific variances in investment sensitivity. Industry is as defined by Fama and French (1997).

In Model (1), the coefficient β_1 measures the difference in the investment behavior of tax-avoiding firms relative to non-tax-avoiding firms. The coefficient β_3 measures the incremental amount of investment for tax-avoiding firms with richer information environments relative to tax-avoiding firms with poorer information environments. The sum of the coefficients β_1 and β_3 captures the general investment behavior of tax-avoiding firms with richer information environments.

To be consistent with H1a, we expect a positive coefficient on *TaxAvoid* (β_1), suggesting that tax-avoiding firms tend to invest more than their counterparts. To be consistent with H2a and H2b, we expect a negative coefficient on *TaxAvoid*Inf* (β_3), suggesting that tax-avoiding firms with richer information environments (*i.e.*, financial reporting quality is higher or financial analysts are more informed) tend to invest less than their counterparts with poorer information environments. In Model (1), standard errors are clustered at the firm level to control for cross-sectional dependence (Peterson, 2009).

4.3.2 Multinomial Analysis on the Investment Level

Following Biddle *et al*. (2009), we estimate a multinomial logistic regression (Model 2) that tests the likelihood that a tax-avoiding firm might be in the extreme investment residual quartile as a function of the quality of information environment. We construct a variable (*ResInvest*) that equals the residual from the investment regression used in Biddle *et al.* (2009) as discussed in *Appendix* C. Firm-year observations in the top quartile of *ResInvest* are classified as over-investing (*Over*) and firm-year observations in the middle two quartiles are classified as the benchmark group (*Normal*). Since we are interested in the likelihood of overinvestment relative to normal investment, the results comparing the under-investing group to the benchmark group are not reported. We expect a rich information environment will mitigate the likelihood of overinvestment by tax-avoiding firms. Specifically, we expect that tax-avoiding firms with richer information environments are less likely to overinvest than their counterparts with poorer information environments.

$$Overinvest = \beta_1 TaxAvoid + \beta_2 Inf + \beta_3 TaxAvoid*Inf + Controls \qquad (2)$$

Similar to the unconditional analysis discussed in section 4.3.1, this multinomial analysis is conducted using the two composite measures of the information environment (*Inf_FRQ* or *Inf_ANA*). The coefficient β_3 is expected to be negative, indicating that tax avoidance reduces investment in settings where overinvestment is more likely.

5. Empirical Results

5.1 Sample Selection

[Insert Table 1 Here]

We obtain financial statement data from *Compustat*, stock return data from *CSRP* and analyst forecast data from *IBES* between 1986 and 2012. To calculate the financial reporting

quality measures (*PerfDA*, *DisWCA*, *DisRev*) based on cash flow statement data, our sample period starts from the year 1986 when cash flow data became available in *Compustat*.[9] We require firms to have available data for *CETR* and *GAAPETR* to measure tax avoidance. Following the prior literature (Dyreng *et al.*, 2008), we discard observations if the denominator of the cash effective tax rate (*CETR*), pre-tax income adjusted for special items, is negative and we truncate *CETR* measures between 0 and 1. We require firms to have positive assets and sales. Financial firms (SIC codes 6000-6999) and utilities (SIC codes 4900-4999) are excluded due to the different nature of their financial reporting and investments. We also require firm-year observations to have one-year ahead total investment, yielding 31,404 firm-years representing 5,245 firms. Across different information environment proxies, the number of firm-years in the sample ranges from 22,601 (using *FE*) to 15,786 (using *Dispersion*). The sample size is further reduced when corporate governance variables are required. Also, the number of observations varies depending on the type of test conducted. To mitigate the influence of outliers, we winsorize all continuous variables at the 1% and 99% levels. The sample selection procedures are reported in Table 1 Panel A.

Overall, the sample firms are from 43 industries when industry is defined according to the Fama-French 48 industry classifications. Table 1 Panel B reports the industry distribution of firm-year observations for the top-five industries in the sample. The top-five industries represented are Business Services (13.4%), Chips (7.0%), Wholesale (5.2%), Machines (5.0%), and Computers (4.6%).

5.2 Descriptive Statistics

[Insert Table 2 Here]

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[9] Collins and Hribar (2002) document that estimating accruals using a balance-sheet approach leads to noisy and biased estimates.

Table 2 Panel A presents univariate statistics of our sample firms. We partition the sample into tax-avoiding and non-tax-avoiding subsamples using the industry tercile values of tax avoidance proxies for each year. The observations in the top industry tercile values of *CETR* are considered the tax-avoiding group and the other observations are considered the non-tax-avoiding group. For brevity, we only report the results based on *CETR*, but using other measures of tax avoidance does not alter our inferences. Column 1 reports the descriptive statistics of firms with less tax avoidance, column 2 reports the descriptive statistics of firms with greater tax avoidance, and column 3 reports the mean (median) differences between the two groups. Tax-avoiding firms invest more (the mean value of *Invest* is 0.179) than non-tax-avoiding firms (the mean value of *Invest* is 0.152), providing initial evidence that tax savings may facilitate overinvestment. Also, tax-avoiding firms exhibit lower financial reporting quality than non-tax-avoiding firms on average for all three proxies (recall that all three measures of financial reporting quality are multiplied by negative one so that greater values represent better quality of financial reporting and information environment). Tax-avoiding firms are followed by slightly more analysts (the mean value of *Coverage* is 9.505) than non-tax-avoiding firms (the mean value of *Coverage* is 9.027). Consistent with the findings of Balakrishnan *et al*. (2012) that tax avoidance increases the difficulty faced by investors and analysts to forecast future profitability, absolute earnings forecast errors as well as the dispersion of forecast errors are significantly higher on average for tax avoiding firms. In summary, firms in the two groups are different on all dimensions.

Table 2 Panel B shows the Pearson correlations. Overall, the correlations reinforce the relationship between the variables reported in descriptive statistics. All three proxies of financial reporting quality are significantly and negatively correlated with investment. Also, although all three proxies of financial reporting quality are significantly and positively correlated with each

other as in Chen *et al*. (2011), the correlations coefficients are significantly below one implying that each of financial reporting quality measures captures a unique aspect of reporting quality and using various financial reporting quality proxies would increase the generalizability of the inferences. In general, tax avoidance is negatively associated with financial reporting quality and proxies of analysts forecasting environments. Tax avoidance measured by cash effective tax rate (*CETR*) is positively correlated with analyst forecast errors in absolute terms, and tax avoidance measured by GAAP effective tax rate (*GAAPETR*) is positively correlated with analyst forecast dispersion. Since correlations do not control for differences in firm and industry characteristics, we now turn to the tests using multivariate analyses.

5.3 Primary Results

5.3.1 **Investment, Tax Avoidance, and the Quality of the Information Environment**

[Insert Table 3 Here]

Table 3 presents the results on the association between investment levels and tax avoidance estimating Model (1). All else being equal, we expect tax avoidance to be positively associated with investment level due to firms having more free cash flow. Further, we expect a richer information environment to mitigate this relationship.

The results using *CETR* as the dependent variable are reported in columns 1 and 2. In column 1 (*Inf* is measured by *Inf_FRQ),* the coefficient on *TaxAvoid*, β_1, is positive and significant (*coeff.*=0.040, *t-stat*=4.72), suggesting that tax-avoiding firms invest more than non-tax-avoiding firms. The coefficient on *TaxAvoid*Inf*, β_3, is negative and significant (*coeff.*=-0.033, *t-stat*=-2.18), suggesting that tax-avoiding firms invest less as the financial reporting quality increases. An F-test of the sum of β_1 and β_3 is significant (*t-stat*=2.34, *p-value*<0.1), indicating that tax-avoiding firms exhibit higher investment levels than non-tax-avoiding firms even with higher financial

reporting quality. Consistent results are shown in column 2 (*Inf* is measured by *Inf_ANA*). In addition, when *GAAPETR* is used as the dependent variable (reported in columns 3 and 4), the results are mostly unchanged. These results indicate that the investment level of tax-avoiding firms is not statistically different from that of non-tax-avoiding firms in the presence of rich information environments, suggesting the potential benefit of rich information environments in eliminating potential overinvestment problems among tax-avoiding firms.

Our inferences regarding the association between the quality of the information environment and investment levels hold after including controls for corporate governance in the model (*InstiOwn*). Overall, the results on the control variables are generally consistent with our expectations. For example, in column 1, *MtB*, *ROA*, *stdInvest*, and *InstiOwn* are positively associated with investment levels, while *Size* and *stdSales* are negatively associated with investment levels.

5.3.2 Overinvestment, Tax Avoidance, and the Quality of the Information Environment

[Insert Table 4 Here]

Table 4 reports the results of a multinomial regression that tests the likelihood that a firm might be overinvesting as a function of tax avoidance and the quality of the information environment. As expected, in columns 1 and 2 (where *TaxAvoid* is measured as the *CETR*), the coefficients on *TaxAvoid*, β_1, are both positive and significant (*coeff.*=0.370, *chi-square*=22.40; *coeff.*=0.424, *chi-square*=34.98), suggesting that tax-avoiding firms are more likely to overinvest than are non-tax-avoiding firms. Further, in column 1, the coefficient on *TaxAvoid*Inf* (*Inf* is measured as *Inf_FRQ*), β_3, is negative and significant (*coeff.*=-0.131, *chi-square*=3.99), suggesting that tax-avoiding firms with better financial reporting quality are less likely to overinvest than tax-avoiding firms with poorer financial reporting quality. In column 2 (where *Inf* is measured as

Inf_ANA), β_3, is negative and significant (*coeff.*=-0.159, *chi-square*=2.46), suggesting that tax-avoiding firms with more informed analysts are less likely to overinvest than tax-avoiding firms with less informed analysts. Similar results are shown in columns 3 and 4 (where *TaxAvoid* is measured as *GAAPETR*). Overall, the results regarding overinvestment are consistent with our conjecture and produce the predicted signs across all tax proxies and information environment proxies.

The results in Table 4 suggest that tax-avoiding firms are more likely to overinvest, especially when the information environment is poorer, and that any potential investment benefits (especially alleviation of the overinvestment problem) are concentrated among firms having richer information environments.

5.4 Robustness Tests

5.4.1 Alternative Measures of Tax Avoidance

[Insert Table 5 Here]

Although our primary tax proxies, *CETR* and *GAAPETR*, are widely used in the tax avoidance literature, they are subject to several weaknesses. For example, Hanlon and Heitzman (2010) note that these variables reflect a broad spectrum of tax avoidance activities with both certain and uncertain outcomes, and thus may be farthest from the underlying construct of tax avoidance. As a robustness check, we use three alternative measures of tax avoidance (*DTAX*, *SHELTER*, and *UTB*) to confirm our inference. [10] Both discretionary permanent book-tax differences (*DTAX*) and the tax shelter prediction score in Wilson (2009) (*SHELTER*) capture risky tax positions (Rego and Wilson, 2012). The amount of unrecognized tax benefits (*UTB*) is an

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[10] Each of these measures is subject to its own caveat. For example, the *DTAX* measure does not consider tax avoidance activities generating temporary book-tax differences, while the *SHELTER* score is highly correlated with underlying firm characteristics. Finally, the *UTB* may reflect measurement errors and managerial judgment.

additional proxy for tax avoidance, which was recently made available by Financial Accounting Standard Board Financial Interpretation No.48 (FIN48). Lisowsky *et al*. (2013) find that the ending balance of *UTB* is positively associated with the usage of tax shelters, supporting *UTB* as a reliable measure of tax sheltering. Details on how we calculate these measures of tax avoidance are discussed in *Appendix* A. All tax avoidance proxies are positively and significantly correlated with each other. As reported in Table 5, the inferences from using these three alternative measures remain the same as in our main results.

5.4.2 Propensity Score Matching Analysis

As a further robustness check, we adopt the propensity-score matching method to more effectively control for the differences in relevant dimensions between the tax-avoiding and non-tax-avoiding samples (Armstrong *et al*., 2010; Cheng *et al*., 2012). In the first stage, we include governance variable, and proxies of the quality of the information environment in the regression and estimate the following model:

TaxAvoid = f(Institutional Ownership, Control Variables)   *(3)*

TaxAvoid is a dummy variable, using *CETR*. All variables on the right hand side of Model (3) are as defined in Model (1). We obtain the propensity score for each firm-year as the predicted value in Model (3) and then match each treatment firm (tax-avoiding firm) with a control firm (non-tax-avoiding firm) that has the closest score in the same year within a distance of 0.01 from the treatment firm's propensity score. If the propensity score match is successful, then we assume that each tax-avoiding firm and its matching control firm are similar in all observable dimensions with the exception of the extent of tax avoidance. Untabulated results comparing the treatment group to the control group show that these two groups are not different along all the dimensions except tax

avoidance levels. In the second stage, we compare the investment levels between tax-avoiding and non-tax-avoiding firms conditional on the *ex-ante* likelihood of over-investing.

[Insert Table 6 Here]

The results of the propensity score matching analysis are reported in Table 6. Panel B reports the results comparing the likelihood of overinvestment to normal investment. The quality of the information environment is measured by *Inf_FRQ* or *Inf_ANA* in the second stage. In Panel B, as expected, the coefficient on *TaxAvoid*, β_1, is positive and significant (*coeff*.=0.733, *chi-square*=9.45) in column 1 (when *Inf_FRQ* is used), consistent with a higher propensity to overinvest among tax-avoiding firms. Similar to the results reported in Table 4, the coefficient on *TaxAvoid*Inf*, β_3, is negative and significant (*coeff*.=-0.812, *chi-square* =3.35), suggesting that a richer information environment mitigates the likelihood of overinvestment among tax-avoiding firms. The inferences remain unchanged when *Inf_ANA* is used in column 2. These results provide corroborating evidence for the conclusions discussed in section 5.3.2.

5.4.3 Change Specifications

Throughout our previous analyses, we employed level regression specifications by associating levels of tax avoidance measures and levels of investment. In this section, we estimate a first-differenced specification ("change" specification) similar to Gallemore and Labro (2015), aimed at mitigating potential bias due to time-invariant unobservable heterogeneity and investigate whether firms increase investment in response to changes in the degree of tax avoidance. Such an analysis of changes may mitigate concerns associated with potential omitted variables.

To facilitate the change analysis when calculating the $\Delta TaxAvoid_t$, we replace the lagged three-year average *CETR* (*GAAPETR*) with the current year *CETR* (*GAAPETR*) and then we calculate the change in the $\Delta CETR$ ($\Delta GAAPETR$) for year *t*. Similar to our earlier analyses, we

25

multiply the change in the annual $\Delta CETR$ by negative one so that greater values represent more tax avoidance. If changes in tax avoidance lead to greater investment (or overinvestment), then we expect the coefficient on the change in tax avoidance to be positive and significant. We also first-difference all of the independent variables. However, diagnostic tests indicate that the information environment measures are not normally distributed when differenced (the *p*-value of Kolmogorov-Smirnov test for the investment efficiency measures is less than 0.01), therefore, we use the percentile ranks of the first differences for these proxies. For our dependent variable, investment, we also use the first-difference of investment.

[Insert Table 7 Here]

Results on investment levels are reported in Panel A of Table 7. Using $\Delta CETR$ as the proxy for tax avoidance, columns 1 and 2 report results showing a significantly positive association between changes in tax avoidance and changes in one-year ahead investments with the quality of the information environment mitigating this relationship, corroborating our main results. In tests where we substitute $\Delta GAAPETR$ as the proxy for tax avoidance (reported in columns 3 and 4), the inferences remain unchanged.

Results on overinvestment are reported in Panel B of Table 7. The dependent variable, *Switch*, equals one for firms switching from the benchmark group (*Normal*) to the over-investing group (*Over*) from year *t+1* to *t+2*, and zero for firms that switch from *Over* to *Normal*. Firms that do not switch from one group to the other are excluded. Across all columns, we find a positive association between tax avoidance and overinvestment. The interaction between tax avoidance and the information environment is again negative and significant. In sum, the results from the change specification are consistent with the results of our levels regressions and thus mitigate concerns that the association documented in the main analyses simply captures unobservable firm-specific

26

factors or changes in the economy that affect both the investment level as well as the degree of tax avoidance.

5.4.4 Using a Restricted Sample with Available G-index

[Insert Table 8 Here]

Using a restricted sample with data available for the G-index of anti-takeover provisions (*G*) as another control variable for corporate governance, we re-estimate Models (1) and (2) including *G* and its interaction term with information environment variables (*Inf*). We choose to not include the G-index in our earlier results because of the large reduction in the sample size that would entail. The results of this additional test are reported in Table 8. Again, our inferences remain unchanged from our earlier analysis.

6. Conclusion

In this paper, we empirically examine whether the quality of the information environment influences the use of tax savings to invest. We argue that tax savings represent either increased potential for managerial opportunism or a better ability to carry out profitable projects depending on the quality of the information environment. Our evidence suggests that tax-avoiding firms are more likely to overinvest than non-tax-avoiding firms, but the quality of the information environment moderates the relationship between tax avoidance and overinvestment. That is, a rich information environment is a necessary condition for tax savings to be invested efficiently.

To the extent that the linkage between tax savings and investment efficiency depends on the quality of the information environment, a comparison of corporate investment behaviors between tax-avoiding and non-tax-avoiding firms without regard to the quality of the information environment would be incomplete. This study highlights the importance of considering the quality

of the information environment, an area overlooked in previous studies in the tax avoidance literature when studying the economic consequences of tax avoidance. At the same time, this study informs investors of the importance of considering the extent of tax avoidance jointly with the quality of the information environment when evaluating the implications of tax avoidance on firm value.

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Appendix A: Variable Measurement

Dependent Variables:

$Invest_{t+1}$	= the sum of research and development expenditures, capital expenditures and acquisition expenditures less the sale of property, plant, and equipment at year *t+1* scaled by total assets at year *t*.
$ResInvest_{t+1}$	= *ResInvest* is a ranked variable based on the residual from the regression of industry average investment on industry average sales growth (Biddle *et al.*, 2009). To do so, we estimate the following model: $$Invest_{ind,t} = SalesGrowth_{ind,t-1}$$ Where $Invest_{ind,t}$ is the average investment of all firms in each industry-year group. To compute the averages, we impose a minimum of 20 firms per industry-year. Industry is defined by Fama and French (1997). We rank the industry-year specific residuals of the model into deciles and rescale the decile rankings from 0 to 1.
Overinvest/Normal	Firm-year observations in the top quartile of *ResInvest* are classified as over-investing (*Over*) and firm-year observations in the middle two quartiles are classified as the benchmark group (*Normal*).
Switch	= one for firms that switch from the benchmark group (*Normal*) to the over-investing group (*Over*), and zero for firms that switch from the over-investing group (*Over*) to the benchmark group (*Normal*).

Independent Variables:

CETR	= industry-size matched 3-year average cash effective tax rate = the sum of a firm's total cash taxes paid from year *t-2* to *t* scaled by the sum of its total pretax income before special items over the same period, adjusted for the median of the same quintile of total assets and in the same industry. We multiply *CETR* by minus one so that greater values represent more tax avoidance.
GAAPETR	= industry-size matched 3-year average of traditional accrual-based effective tax rate = the sum of a firm's total income tax expense from year *t-2* to *t* scaled by the sum of its total pretax income before special items over the same period, adjusted for the median of the same quintile of total assets and in the same industry. We multiply *GAAPETR* by minus one so that greater values represent more tax avoidance.
DTAX	= Discretionary Permanent Book-Tax Differences are the residual from the regression: PermBTD = Pretax Income minus Estimated Taxable Income divided by total assets, where Estimated Taxable Income = (Current U.S. Tax Expense + Current Foreign Tax Expense) / 35%, minus (Deferred Tax Expense / 35%)) on Goodwill and Other Intangibles, Equity in Earnings, Minority Interest in Earnings, Current State Tax Expense, change in Tax Loss Carry Forward, and Prior-Period Perm BTD, all scaled by prior-period total assets. The estimation is performed by year and 2-digit SIC code on the entire population of Compustat firms with at least 15 observations in each industry-year (Frank *et al.*, 2009).
SHELTER	= the rank value of the tax shelter prediction score, *i.e.*, the predicted value from the regression:

TSPS = -4.86 + 5.2*BTD + 4.08*DAP − 1.41*Leverage + 0.76*Size + 3.51*ROA + 1.72*FINC + 2.43*R&D

Where BTD, book-tax difference, is equal to pre-tax book income less taxable income (federal tax expense plus foreign tax expense divided by the statutory tax rate of 35%) less the change in NOL carryforwards; DAP, discretionary accruals, is calculated using the cross-sectional modified Jones model w/ lagged return on assets; Leverage, leverage ratio, long-term debt divided by total assets; Size is the natural log of total assets; ROA, return on assets, is equal to pre-tax income divided by total assets; FINC, is an indicator variable for foreign operations, and equals 1 if there is non-zero foreign income, and 0 otherwise; R&D is research and development scaled by total assets (Wilson, 2009).

UTB	= ending balance (in millions) of the unrecognized tax benefit (UTB) divided by total assets.
TaxAvoid	= *CETR* or *GAAPETR* (in primary analyses) and *DTAX*, *SHELTER*, or *UTB* (in robustness analyses).
PerfDA	= the performance-matched discretionary accrual measure as described in *Appendix* B.
DisWCA	= the discretionary working capital accruals as described in *Appendix* B.
DisRev	= the discretionary revenues as described in *Appendix* B.
Inf_FRQ	= the aggregate measure of three financial reporting qualities variables (*PerfDA*, *DisWCA*, *DisRev*), summing the percentile ranks of these three variables.
Coverage	= the natural logarithm of the number of unique analysts covering a firm.
FE	= the absolute value of the forecast EPS minus the actual EPS and deflated by the stock price at the beginning of the year, where forecast EPS is the most recent figure prior to the announcement date of the year but subsequent to the previous EPS announcement.
Dispersion	= the standard deviation of the forecast EPS of the year, deflated by the stock price at the beginning of the year.
Inf_ANA	= the aggregate measure of three analyst forecast variables (*Coverage*, *FE, Dispersion*), summing the percentile ranks of these three variables.

Other Variables:

$Cash_t$	cash holding in year *t*.
$Size_t$	natural logarithm of total assets in year *t*.
MtB_t	market to book ratio in year *t*.
ROA_t	return on assets in year *t*.
$Leverage_t$	long-term debt divided by total assets in year *t*.
$Dividend_t$	dividend payout ratio in year *t*.
$stdSales_t$	standard deviation of sales from year *t-4* to year *t*.
$stdInvest_t$	standard deviation of investment from year *t-4* to year *t*.
$stdROA_t$	standard deviation of return on assets from year *t-4* to year *t*.
$InstiOwn_t$	institutional ownership ratio in year *t*.
G_t	G-index in year *t* (available during 1993 and 2007).
Industry	the 48 industries defined by Fama and French (1997).

Appendix **B: Measures of the Quality of the Information Environment (*Inf_FRQ*)**

Inf_FRQ is an aggregate measure of the following three measures of financial reporting quality, summing the percentile ranks of these three variables.

1. Performance-matched discretionary accruals (*PerfDA*) (Kothari *et al.*, 2005).
   PerfDA is estimated cross-sectionally each year using all firm-years in the same two-digit SIC code.
   $$TA = \alpha + \beta_1 1/TotalAssets_{i,t-1} + \beta_2 (\Delta Rev_{i,t} - \Delta AR_{i,t}) + \beta_3 PPE_{i,t} + \varepsilon_{i,t}$$
Where *TA*=total accruals=net income minus cash flow from operations, *TotalAssets*=total assets, ΔRev=change in revenues scaled by lagged total assets, ΔAR=change in accounts receivable scaled by lagged total assets, and *PPE*=gross value of PPE scaled by lagged total assets. Residuals from the above model are modified Jones-model discretionary accruals (Jones, 1991). We match each firm-year observation with another from the same two-digit SIC code and year with the closest return on assets in year *t*. Finally, *PerfDA* is defined as the Jones-model discretionary accrual minus the matched firm's Jones-model discretionary accrual in year *t*.

2. Discretionary working capital accruals (*DisWCA*) (Chen *et al.*, 2011)
   Dechow and Dichev (2002) develop a model for expected accruals and interpret the deviation from this expected value as the estimation error in accruals. This measure focuses on the strength of the relation between current accruals and past, present, and future cash flows. We use the Dechow-Dichev model as modified by McNichols (2002) and Francis *et al.* (2005), adjusting for negative cash flows (Ball and Shivakumar 2006; Givoly *et al.*, 2010). The following model is estimated for each industry-year with at least 20 observations:
   $$WCA_{i,t} = a_0 + a_1 OCF_{i,t-1} + a_2 OCF_{i,t} + a_3 OCF_{i,t+1} + a_4 \Delta Rev_{i,t} + a_5 PPE_{i,t} + a_6 \Delta OCF_{i,t} + a_7 OCF_{i,t} * \Delta OCF_{i,t} + \varepsilon_{i,t}$$
Where *WCA*=working capital accruals=the change in non-cash current assets minus the change in current liabilities other than short-term debt and taxes payable, scaled by lagged total assets; *OCF*=cash flow from operations=the sum of net income, depreciation, and amortization, minus *WCA*, all scaled by lagged total assets (Chen *et al.*, 2011); ΔRev=annual change in revenues scaled by lagged total assets; *PPE*=property, plant, and equipment, scaled by lagged total assets; and ΔOCF=an indicator variable for negative operating cash flows. The residuals $\varepsilon_{i,t}$ represent the estimation errors in the current accruals that are not associated with operating cash flows and that cannot be explained by the change in revenue and the level of *PPE*. *WCA* is the absolute value of $\varepsilon_{i,t}$.

3. Discretionary Revenue (*DisRev*) (Chen *et al.*, 2011)
   We use discretionary revenues based on McNichols and Stubben (2008) and Stubben (2010). We use the following regression for each industry-year with at least 20 observations:
   $$\Delta AR_{i,t} = a_0 + a_1 \Delta Rev_{i,t} + \varepsilon_{i,t}$$
Where ΔAR=the annual change in accounts receivable and ΔRev=the annual change in revenues, each scaled by lagged total assets. *DisRev* are the residuals $\varepsilon_{i,t}$.

All these three variables are multiplied by negative one so that greater values represent better quality of financial reporting and information environment.

Appendix **C: Measure of the Likelihood of Overinvestment (*ResInvest)***

We use a proxy for the likelihood of overinvestment (*ResInvest*) in the conditional analysis on tax avoidance and investment efficiency (discussed in section 4.3.2).

ResInvest is a ranked variable based on the residual from the regression of industry average investment on industry average sales growth (Biddle *et al*., 2009). To do so, we estimate the following model:

$$Invest_{ind,t} = SalesGrowth_{ind,t-1}$$

Where *Invest$_{ind,t}$* is the average investment of all firms in each industry-year group. To compute the averages, we impose a minimum of 20 firms per industry-year. Industry is defined by Fama and French (1997). We rank the industry-year specific residuals of the model into deciles and rescale the decile rankings from 0 to 1.

TABLE 1
Sample Description

Panel A: Sample Selection

	Number of firm-years	Number of unique firms
All firms with available financial statement data from *Compustat*, stock return data from *CRSP*, 1986-2012 with positive assets and sales	137,674	15,278
Less: firm-years from financial and utilities industries	124,731	14,590
Less: firm-years with missing data for tax avoidance proxies, 1-year ahead investment and analyst coverage	31,404	5,245
Less: firm-years with missing data for Institutional Ownership (*InstiOwn*)	22,601	3,813
Final Sample (changes across different Inf proxies):		
firm-years with non-missing performance adjusted accruals (*PerfDA*)	17,023	3,058
firm-years with non-missing discretionary working capital accruals (*DisWCA*)	19,535	3,461
firm-years with non-missing discretionary revenues (*DisRev*)	19,086	3,406
Firm-years with non-missing FRQ composite proxy	**15,928**	**2,925**
firm-years with non-missing forecast error (*FE*)	22,601	3,813
firm-years with non-missing analyst dispersion (*Dispersion*)	15,786	3,083
Firm-years with non-missing ANA composite proxy	**15,786**	**3,083**

Panel B: Industry Distribution

Industry	Number of firm-years	Percentage of firm-years
Business Services	3,024	13.4%
Chips	1,583	7.0%
Wholesale	1,173	5.2%
Machines	1,121	5.0%
Computers	1,030	4.6%
Firms from the top-5 industries	*7,931*	*35.2%*

Panel A shows the sample selection procedures. Panel B reports the distribution of firm-year observations and unique firms from the top-five industries. Industry is defined according to the Fama-French 48 industry classification (Fama and French, 1997).

TABLE 2
Descriptive Statistics

Panel A: Mean/median Differences between Non-tax-avoiding *vs*. Tax-avoiding Firms

Variables	(1) Non-tax-avoiding Firms			(2) Tax-avoiding Firms			(3) Mean diff.	Median diff.
	N	Mean	Median	N	Mean	Median	*p-value*	*p-value*
CETR	15,345	-0.063	-0.048	7,256	0.132	0.120	***	***
GAAPETR	15,345	-0.040	-0.044	7,256	0.041	0.023	***	***
Invest$_{t+1}$	15,345	0.152	0.105	7,256	0.179	0.126	***	***
PerfDA	11,869	-0.071	-0.051	5,154	-0.074	-0.052	***	***
DisWCA	13,375	-0.034	-0.024	6,160	-0.036	-0.025	***	***
DisRev	13,032	-0.026	-0.016	6,054	-0.028	-0.016	***	***
Coverage	15,345	9.027	7.000	7,256	9.505	7.000	***	***
FE	15,345	-0.007	0.004	7,256	0.002	0.005	***	***
Dispersion	10,687	0.003	0.001	5,099	0.004	0.001	***	***
Cash	15,345	0.182	0.086	7,256	0.229	0.092	***	***
MtB	15,345	3.007	2.243	7,256	3.072	2.183	***	
ROA	15,345	0.154	0.128	7,256	0.134	0.107	***	***
Leverage	15,345	0.156	0.129	7,256	0.182	0.159	***	***
Dividend	15,345	0.334	0.000	7,256	0.377	0.000	***	
Size	15,345	6.467	6.362	7,256	6.448	6.337	***	
stdSales	15,345	0.314	0.180	7,256	0.336	0.194	***	***
stdInv	15,345	0.100	0.057	7,256	0.122	0.070	***	***
stdROA	15,345	0.056	0.038	7,256	0.064	0.043	***	***
InstiOwn	15,345	0.599	0.623	7,256	0.605	0.636	***	
G	9,115	8.819	9.000	4,121	8.700	9.000	***	**

Panel B: Pearson Correlation

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.CETR	1									
2.GAAPETR	**0.428** ***	1								
3.Invest$_{t+1}$	**0.081** ***	**0.015** **	1							
4.PerfDA	**-0.018** **	**-0.026** ***	**-0.042** ***	1						
5.DisWCA	**-0.028** ***	**-0.029** ***	**-0.043** ***	**0.219** ***	1					
6.DisRev	**-0.014** *	**-0.016** **	**-0.034** ***	**0.150** ***	**0.340** ***	1				
7.Coverage	**0.044** ***	-0.008	-0.004	**0.053** ***	**0.127** ***	**0.163** ***	1			
8. FE	**0.033** ***	0.004	**0.015** **	0.003	**0.021** ***	**0.013** *	**0.043** ***	1		
9.Dispersion	-0.006	**0.043** ***	**-0.019** **	**-0.019** **	**-0.054** ***	**-0.049** ***	**-0.076** ***	**-0.202** ***	1	
10. InstiOwn	0.006	**-0.046** ***	**-0.048** ***	**0.074** ***	**0.160** ***	**0.172** ***	**0.418** ***	**0.0556** ***	**-0.089** ***	1
11.G	-0.003	**0.047** ***	**-0.088** ***	**0.050** ***	**0.090** ***	**0.097** ***	**0.096** ***	0.004	**-0.022** **	**0.120** ***

Panel A shows the mean (median) statistics of non-tax-avoiding firms (in column 1) and tax-avoiding firms (in column 2), and the mean/median differences between non-tax-avoiding *vs.* tax-avoiding firms (in column 3). Panel B shows the Pearson correlations among primary variables. Correlation coefficients and the significance level of *p*-values are reported. ***, ** and * indicate statistical significance at the 1%, 5% or 10% levels using a two-tailed t-test. Correlation coefficients with significant results are shown in bold. All variables are defined in *Appendix* A.

TABLE 3
Unconditional Analysis:
Investment, Tax Avoidance, and the Quality of the Information Environment

The regression model is:

$Invest_{i,t}=\beta_0+\beta_1TaxAvoid_{i,t-1}+ \beta_2Inf_{i,t-1}+\beta_3TaxAvoid*Inf_{i,t-1}+\beta_4Cash_{i,t}+\beta_5MtB_{i,t}+\beta_6ROA_{i,t}+\beta_7Leverage_{i,t}+\beta_8Dividend_{i,t}+\beta_9Size_{i,t}+\beta_{10}StdSales_{i,t}+\beta_{11}StdSales_{i,t}$
$+\beta_{12}StdInv_{i,t}+\beta_{13}StdROA_{i,t}+\beta_{14}InstiOwn_{i,t} +\beta_{15}Inf*Cash_{i,t}+\beta_{16}Inf*MtB_{i,t}+\beta_{17}Inf*ROA_{i,t}+\beta_{18}Inf*Leverage_{i,t}+\beta_{19}Inf*Dividend_{i,t}$
$+\beta_{20}Inf*Size_{i,t}+\beta_{21}Inf*StdSales_{i,t} +\beta_{22}Inf*StdSales_{i,t}+\beta_{23}Inf*StdInv_{i,t}+\beta_{24}Inf*StdROA_{i,t}+\beta_{25}Inf*InstiOwn_{i,t}+\Sigma Industry_i+\Sigma Year_t+\varepsilon_{i,t}$ (1)

	TaxAvoid = CETR						TaxAvoid = GAAPETR					
	(1)			(2)			(3)			(4)		
	Inf = Inf_FRQ			Inf = Inf_ANA			Inf = Inf_FRQ			Inf = Inf_ANA		
	Coeff.		t-stat	Coeff.		t-stat	Coeff.		t-stat	Coeff.		t-stat
Intercept	0.171	***	8.18	0.190	***	12.94	0.176	***	13.19	0.160	***	4.11
TaxAvoid	0.040	***	4.72	0.030	***	8.13	0.020	***	4.23	0.028	***	2.88
Inf	-0.005		-0.14	0.022	*	1.57	-0.009		-0.65	0.069	*	1.54
TaxAvoid*Inf	-0.033	**	-2.18	-0.011	**	-2.07	-0.014	***	-2.34	-0.037	**	-2.11
Cash	0.030		1.17	0.010		1.22	0.016	*	1.39	-0.032	**	-2.27
MtB	0.003	**	2.10	0.004	***	5.02	0.004	***	4.46	0.005	***	2.73
ROA	0.139	***	3.23	0.130	***	5.63	0.141	***	5.84	0.194	***	3.84
Leverage	-0.041		-1.17	-0.047	***	-3.40	-0.029	**	-1.65	-0.050	*	-1.62
Dividend	0.000		-1.12	0.000	**	-2.18	0.000	***	-3.15	-0.001	*	-1.40
Size	-0.014	***	-5.17	-0.014	***	-11.35	-0.013	***	-9.54	-0.015	***	-4.75
stdSale	-0.034	***	-3.63	-0.020	***	-3.49	-0.028	***	-4.82	-0.014		-1.05
stdInvest	0.207	***	5.82	0.107	***	6.55	0.136	***	6.76	0.154	***	4.16
stdROA	0.030		0.38	0.031		0.87	0.087	**	1.95	0.033		0.36
InstiOwn	0.059	***	3.35	0.036	***	4.42	0.056	***	5.97	0.061	***	3.26
Inf*Cash	-0.019		-0.39	-0.004		-0.32	0.022	*	1.45	0.096	***	3.52
Inf*MtB	0.000		0.10	-0.002	**	-2.13	-0.001		-1.04	-0.005	*	-1.56
Inf*ROA	0.015		0.17	0.047	*	1.41	-0.009		-0.24	-0.078		-0.85
Inf*Leverage	0.009		0.15	0.006		0.32	-0.007		-0.32	0.023		0.41
Inf*Dividend	0.000		0.65	0.000		-0.72	0.000		0.33	0.002		0.94
Inf*Size	0.005		1.04	-0.001		-0.42	0.004	**	2.30	0.002		0.30

Inf*stdSale	0.038	**	1.93	0.006		0.75	0.029	***	3.04	-0.005		-0.19
Inf*stdInvest	-0.224	***	-3.50	0.002		0.10	-0.071	***	-2.69	-0.107	*	-1.59
Inf*stdROA	0.042		0.27	-0.097	**	-1.67	-0.083	*	-1.38	-0.083		-0.49
Inf*InstiOwn	-0.031		-0.98	-0.008		-0.75	-0.020	**	-1.68	-0.051	*	-1.49
Industry Fixed Effects	Included			Included			Included			Included		
Year Fixed Effects	Included			Included			Included			Included		
Joint Significance Test:												
$\beta_1+\beta_3=0$	2.34*			1.81*			0.00			1.04		
Adj. R^2	12.8%			13.6%			12.6%			14.2%		
N	15,928			15,786			15,928			15,786		

This table shows the results of estimating Model (1) to examine the association among investment level, tax avoidance and the quality of the information environment. Tax avoidance (*TaxAvoid*) is measured as *CETR* or *GAAPETR*. The quality of the information environment (*Inf*) is measured as *Inf_FRQ* or *Inf_ANA*. Coefficients are presented with t-statistics based on firm-clustered standard errors. ***, ** and * denote significance at a 1, 5, and 10 percent levels, for one-tailed tests where there are predictions and two-tailed tests otherwise. All variables are defined in *Appendix* A.

The regression model is:

$$Overinvest = \beta_1 TaxAvoid + \beta_2 Inf + \beta_3 TaxAvoid*Inf + Controls \tag{2}$$

	TaxAvoid = CETR						TaxAvoid = GAAPETR					
	(1)			(2)			(3)			(4)		
	Inf = Inf_FRQ			Inf = Inf_ANA			Inf = Inf_FRQ			Inf = Inf_ANA		
	Coeff.		Chi-squared	Coeff.		Chi-squared	Coeff.		Chi-squared	Coeff.		Chi-squared
Intercept	-1.402	***	22.24	-0.040		0.00	-1.063	***	12.99	-0.267		0.12
TaxAvoid	0.370	***	22.40	0.424	***	34.98	0.259	***	9.23	0.186	***	6.34
Inf	-0.251		0.80	0.184		0.50	0.267		0.90	0.345	*	1.86
*TaxAvoid*Inf*	-0.131	**	3.99	-0.159	*	2.46	-0.286	**	4.75	-0.098	**	3.46
Cash	-0.216	*	1.71	-0.065		0.20	0.109		0.65	0.050		0.26
MtB	0.028	***	6.47	0.025	**	4.82	0.020	**	3.26	0.036	***	11.59
ROA	1.406	***	12.82	1.519	***	16.00	1.637	***	17.65	1.218	***	12.35
Leverage	0.066		0.04	0.417	*	2.54	0.111		0.12	-0.091		0.13
Dividend	-0.369	***	6.70	-0.183	**	3.62	-0.510	***	9.79	-0.149	**	3.70
Size	-0.175	***	32.82	-0.251	***	68.43	-0.240	***	54.57	-0.293	***	94.58
stdSale	-0.224	**	4.01	-0.215	**	4.12	-0.317	***	8.61	-0.285	***	8.59
stdInvest	1.000	***	11.15	0.577	**	4.61	1.912	***	43.13	1.091	***	19.48
stdROA	0.870	*	1.68	0.916	*	2.47	-0.069		0.01	0.709	*	1.68
InstiOwn	0.511	***	8.40	0.662	***	16.94	0.835	***	21.81	0.575	***	14.09
*Inf*Cash*	0.498	**	3.87	-0.024		0.01	0.445	**	4.20	-0.055		0.22
*Inf*MtB*	-0.002		0.02	-0.011		0.51	-0.005		0.08	-0.027	**	3.52
*Inf*ROA*	0.205		0.09	0.538		0.98	-0.705		1.11	0.466		0.86
*Inf*Leverage*	0.167		0.15	-0.172		0.23	0.066		0.02	0.260		0.53
*Inf*Dividend*	0.318	**	4.23	-0.028		0.04	0.417	**	5.29	-0.146		1.19
*Inf*Size*	-0.008		0.03	0.045		1.34	-0.046		1.02	-0.017		0.18
*Inf*stdSale*	0.316	**	3.20	0.003		0.00	0.249	*	2.09	0.126		0.92
*Inf*stdInvest*	-0.529		1.35	0.782	**	4.55	-0.705	*	2.55	0.402		1.35
*Inf*stdROA*	-1.195		1.08	-1.932	**	4.05	0.091		0.01	-1.927	**	4.58

This table shows the results from a multinomial logistic regression Model (2) that tests the likelihood that a tax-avoiding firm might be in the extreme investment residual quartiles as a function of the quality of the information environment.

Inf*InstiOwn	0.081	0.10	-0.510 ***	5.51	-0.044	0.03	-0.169	0.65	The results
Industry Fixed Effects	Included		Included		Included		Included		are from the
Year Fixed Effects	Included		Included		Included		Included		comparison
Psuedo-R²	11.5%		10.5%		18.6%		15.4%		between
N	15,920		20,292		15,845		20,689		

overinvestment and normal investment. Tax avoidance (*TaxAvoid*) is measured as *CETR* or *GAAPETR*. The quality of the information environment (*Inf*) is measured as *Inf_FRQ* or *Inf_ANA*. Coefficients are presented with t-statistics based on firm-clustered standard errors. ***, ** and * denote significance at the 1, 5, and 10 percent levels, for one-tailed tests where there are predictions and two-tailed tests otherwise. All variables are defined in *Appendix* A.

TABLE 5
Alternative Measures of Tax Avoidance

Panel A: Investment, Tax Avoidance, and the Quality of the Information Environment
The regression model is:

$$Invest_{i,t}=\beta_0+\beta_1 TaxAvoid_{i,t-1}+\beta_2 Inf_{i,t-1}+\beta_3 TaxAvoid*Inf_{i,t-1}+\beta_4 Cash_{i,t}+\beta_5 MtB_{i,t}+\beta_6 ROA_{i,t}+\beta_7 Leverage_{i,t}+\beta_8 Dividend_{i,t}+\beta_9 Size_{i,t}+\beta_{10}StdSales_{i,t}+\beta_{11}StdSales_{i,t}$$
$$+\beta_{12}StdInv_{i,t}+\beta_{13}StdROA_{i,t}+\beta_{14}InstiOwn_{i,t}+\beta_{15}Inf*Cash_{i,t}+\beta_{16}Inf*MtB_{i,t}+\beta_{17}Inf*ROA_{i,t}+\beta_{18}Inf*Leverage_{i,t}+\beta_{19}Inf*Dividend_{i,t}+\beta_{20}Inf*Size_{i,t}$$
$$+\beta_{21}Inf*StdSales_{i,t}+\beta_{22}Inf*StdSales_{i,t}+\beta_{23}Inf*StdInv_{i,t}+\beta_{24}Inf*StdROA_{i,t}+\beta_{25}Inf*InstiOwn_{i,t}+\Sigma Industry_i+\Sigma Year_t+\varepsilon_{i,t} \tag{1}$$

	TaxAvoid = DTAX						TaxAvoid = SHELTER						TaxAvoid = UTB					
	(1)			(2)			(3)			(4)			(5)			(6)		
	Inf = Inf_FRQ			Inf = Inf_ANA			Inf = Inf_FRQ			Inf = Inf_ANA			Inf = Inf_FRQ			Inf = Inf_ANA		
	Coeff.		t-stat	Coeff.		t-stat	Coeff.		t-stat	Coeff.		t-stat	Coeff.		t-stat	Coeff.		t-stat
Intercept	0.163	***	4.20	0.229	***	6.81	0.193	***	14.40	0.166	***	4.49	0.178	***	8.54	0.229	***	6.82
TaxAvoid	0.029	***	3.94	0.018	***	3.53	0.026	***	5.12	0.031	***	3.64	0.033	***	4.20	0.027	***	5.46
Inf	0.065	**	2.18	0.098	***	4.64	-0.024	**	-1.69	0.105	***	2.72	-0.007		-0.21	0.101	***	4.75
TaxAvoid*Inf	-0.026	**	-1.83	-0.019	**	-2.03	-0.019	***	-2.93	-0.024	*	-1.58	-0.026	**	-1.73	-0.014	**	-1.64
Cash	0.050	***	3.58	-0.017	**	-2.08	0.018	**	1.71	-0.030	**	-2.17	0.033	**	2.16	-0.018	**	-2.25
MtB	0.004	***	3.89	0.003	***	3.12	0.003	***	4.06	0.006	***	3.76	0.004	***	2.88	0.003	***	3.05
ROA	0.352	***	10.17	0.108	***	4.03	0.126	***	5.31	0.170	***	3.86	0.121	***	3.14	0.118	***	4.37
Leverage	-0.313	***	-11.69	-0.030	**	-1.78	-0.028	*	-1.64	-0.093	***	-3.49	-0.037		-1.25	-0.038	**	-2.22
Dividend	0.000		-0.02	0.000		-1.08	0.000	***	-2.42	0.000		0.06	0.000		-0.35	0.000		-1.06
Size	-0.001		-0.48	-0.020	***	-9.40	-0.016	***	-10.63	-0.014	***	-4.79	-0.015	***	-5.50	-0.020	***	-9.4
stdSale	-0.045	***	-5.82	-0.013	**	-2.16	-0.027	***	-4.59	-0.021	**	-1.86	-0.041	***	-4.73	-0.013	**	-2.08
stdInvest	0.819	***	29.03	0.161	***	8.29	0.136	***	6.95	0.069	**	2.22	0.210	***	6.70	0.158	***	8.14
stdROA	-0.093	*	-1.48	-0.010		-0.24	0.081	**	1.84	0.049		0.61	0.075		1.07	-0.017		-0.39
InstiOwn	0.044	***	3.01	0.029	***	2.79	0.058	***	6.19	0.043	***	2.62	0.066	***	4.07	0.031	***	2.96
Inf*Cash	-0.028		-1.00	0.049	***	3.33	0.020	*	1.29	0.082		3.37	-0.024		-0.79	0.048	***	3.24
Inf*MtB	0.002		1.01	-0.002		-0.99	0.000		-0.44	-0.006	***	-2.66	-0.001		-0.44	-0.002		-1.02
Inf*ROA	0.174	***	2.39	0.047		0.99	0.004		0.10	-0.061		-0.77	0.039		0.48	0.044		0.94
Inf*Leverage	-0.236	***	-4.89	0.005		0.18	-0.005		-0.21	0.121	***	2.45	0.005		0.09	0.015		0.51
Inf*Dividend	0.000		0.22	0.000		0.18	0.000		0.18	-0.002		-0.99	0.000		0.13	0.000		0.15
Inf*Size	-0.003		-0.73	-0.002		-0.74	0.006	***	3.27	-0.006		-1.26	0.007	*	1.39	-0.002		-0.80
Inf*stdSale	0.005		0.32	-0.011		-0.97	0.026	***	2.71	0.009		0.43	0.055	***	2.90	-0.011		-0.95
Inf*stdInvest	-0.654	***	-12.24	-0.090	***	-2.59	-0.068	***	-2.57	0.047		0.83	-0.226	***	-3.82	-0.090	***	-2.59
Inf*stdROA	0.184	*	1.42	-0.011		-0.14	-0.065		-1.07	-0.080		-0.55	-0.051		-0.36	-0.015		-0.19
Inf*InstiOwn	-0.050	**	-1.84	-0.019		-1.04	-0.022	**	-1.82	-0.027		-0.92	-0.042	*	-1.41	-0.025	*	-1.34
Industry	Included			Included			Included			Included			Included			Included		

Fixed Effects Year	Included	Included	Included	Included	Included	Included
Fixed Effects						
Joint Significance Test: $\beta_1+\beta_3=0$	2.63**	0.51	0.04	0.36	0.99	2.38*
Adj. R^2	14.2%	13.5%	12.6%	14.7%	12.7%	13.7%
N	11,068	11,298	9,773	7,454	2,407	3,054

TABLE 5
Alternative Measures of Tax Avoidance

Panel B: Overinvestment, Tax Avoidance, and the Quality of the Information Environment

| | TaxAvoid = DTAX | | | | TaxAvoid = SHELTER | | | | TaxAvoid = UTB | | | |
| | (1) Inf = Inf_FRQ | | (2) Inf = Inf_ANA | | (3) Inf = Inf_FRQ | | (4) Inf = Inf_ANA | | (5) Inf = Inf_FRQ | | (6) Inf = Inf_ANA | |
	Coeff.	Chi-squared	Coeff.	Chi-squared	Coeff.	Chi-squared	Coeff.	Chi-squared	Coeff.	Chi-squared	Coeff.	Chi-squared
Intercept	0.413	0.60	0.728 **	2.88	0.325	0.31	0.099	0.03	0.646	0.72	1.078 *	2.42
TaxAvoid	0.133 **	3.52	0.235 ***	11.47	0.189 **	3.77	0.227 **	3.18	0.515 ***	11.34	0.356 **	5.23
Inf	-0.028	0.02	0.589 ***	12.17	-0.254	1.20	-0.600 *	2.05	0.332	0.45	0.640 *	1.96
TaxAvoid*Inf	-0.248 ***	5.44	-0.197 **	5.10	-0.281 **	4.26	-0.326 *	1.70	-0.429 **	4.29	-0.221 **	2.89
Cash	0.330 ***	8.30	0.155 **	3.20	0.294 **	5.37	0.023	0.01	0.747 ***	6.17	0.355 **	2.97
MtB	0.018 **	4.35	0.041 ***	17.21	0.018 **	3.40	0.022 *	2.23	0.027 *	2.31	0.017	0.73
ROA	0.795 ***	7.81	1.076 ***	16.23	0.898 ***	8.50	1.106 **	5.29	-0.485	0.51	0.730	1.27
Leverage	-0.043	0.03	-0.552 ***	7.54	0.126	0.25	-0.047	0.02	-0.806 **	2.75	-0.042	0.01
Dividend	0.014 **	3.38	0.010 *	2.02	0.003	0.99	-0.026	1.35	0.023	1.20	-0.030	0.47
Size	-0.202 ***	73.91	-0.198 ***	85.04	-0.210 ***	49.85	-0.120 ***	10.16	-0.172 ***	14.21	-0.217 ***	19.79
stdSale	-0.299 ***	14.97	-0.150 **	4.53	-0.275 ***	11.33	0.087	0.46	-0.714 ***	6.31	-0.390 **	3.22
stdInvest	1.966 ***	65.48	1.704 ***	68.53	2.124 ***	67.89	1.275 ***	12.76	3.278 ***	34.10	2.448 ***	20.74
stdROA	0.051	0.020	-0.204	0.43	0.213	0.26	-1.041 *	2.20	-0.382	0.10	0.511	0.39
InstiOwn	0.666 ***	23.77	0.401 ***	10.24	0.611 ***	17.24	0.270 *	1.95	0.184	0.41	-0.043	0.03
Inf*Cash	0.009	0.00	-0.011	0.01	0.172	0.81	0.523	1.58	0.014	0.00	0.064	0.06
Inf*MtB	-0.008	0.33	-0.035 ***	9.58	-0.005	0.12	0.022	0.52	-0.025	1.02	-0.001	0.00
Inf*ROA	0.580	1.46	-0.107	0.10	0.437	0.71	0.321	0.12	1.863 **	3.00	-0.605	0.53
Inf*Leverage	-0.716 **	4.96	0.288	1.29	-0.582 **	2.91	-0.023	0.00	0.575	0.78	-0.494	0.90
Inf*Dividend	0.006	0.14	-0.007	0.83	0.004	0.27	0.031	1.24	-0.305 **	4.72	0.066 *	1.70
Inf*Size	0.006	0.03	-0.035 *	1.78	0.052	1.61	0.036	0.25	-0.044	0.56	-0.032	0.31
Inf*stdSale	0.297 ***	5.54	-0.124 *	2.00	0.139	1.04	-0.386 *	2.38	0.290	0.43	-0.080	0.07
Inf*stdInvest	-0.254	0.53	-0.100	0.14	-0.180	0.23	0.123	0.03	-0.661	0.69	-0.308	0.22
Inf*stdROA	-0.721	1.23	0.427	1.16	-0.002	0.00	2.391 *	2.61	-1.102	0.41	-0.800	0.50
Inf*InstiOwn	-0.081	0.20	-0.050	0.11	-0.188	0.94	-0.050	0.02	-0.132	0.12	0.149	0.19
Industry Fixed Effects	Included		Included		Included		Included		Included		Included	
Year Fixed Effects	Included		Included		Included		Included		Included		Included	

47

Adj. R²	20.3%	19.1%	19.6%	12.0%	24.0%	23.1%
N	11,068	11,298	9,773	7,454	2,407	3,054

Panel A shows the results of estimating Model (1) to examine the association among the investment level, tax avoidance and the quality of the information environment. Tax avoidance (*TaxAvoid*) is measured as *DTAX*, *SHLETER*, or *UTB*. The quality of the information environment (*Inf*) is measured as *Inf_FRQ* or *Inf_ANA*. Panel B shows the results from a multinomial logistic regression Model (2) that tests the likelihood that a tax-avoiding firm might be in the extreme investment residual quartiles as a function of the quality of the information environment. The results are from the comparison between overinvestment and normal investment. Tax avoidance (*TaxAvoid*) is measured as *DTAX*, *SHLETER*, or *UTB*. The quality of the information environment (*Inf*) is measured as *Inf_FRQ* or *Inf_ANA*. Coefficients are presented with t-statistics based on firm-clustered standard errors. ***, ** and * denote significance at the 1, 5, and 10 percent levels, for one-tailed tests where there are predictions and two-tailed tests otherwise. All variables are defined in *Appendix* A.

TABLE 6
Propensity Score Matching Analysis:
Investment Efficiency, Tax Avoidance, and the Quality of the Information Environment

Panel A: The First Stage: analysis of maximum likelihood estimates

The Regression Model is:

TaxAvoid=f(Invest, Inf. Variables, Institutional Ownership, Controls)   *(3)*

	Dependent Variable = CETR		
	Coeff.		*Wald Chi-squared*
Intercept	-1.372	***	50.56
Invest	1.114	***	67.63
PerfDA	-0.333		1.19
DisWCA	-2.109	***	8.04
DisRev	-0.460		0.31
Coverage	0.022	***	28.17
FE	0.633	***	16.01
Dispersion	4.829	**	4.19
Cash	1.481	***	157.63
MtB	0.035	***	21.09
ROA	-4.576	***	226.27
Leverage	0.990	***	30.81
Dividend	-0.001		0.08
Size	-0.057	***	6.82
stdSale	-0.212	***	8.23
stdInvest	0.855	***	20.27
stdROA	2.335	***	19.56
InstiOwn	0.230	**	5.15
Industry Fixed Effects		Included	
Year Fixed Effects		Included	
Adj. R^2		7.1%	
N		11,415	

TABLE 6
Propensity Score Matching Analysis:
Investment Efficiency, Tax Avoidance, and the Quality of the Information Environment

Panel B: The Second Stage: over vs. normal investment

| | (1) Inf=Inf_FRQ | | | (2) Inf=Inf_ANA | | |
	Coeff.		Chi-squared	Coeff.		Chi-squared
Intercept	-1.141	*	2.21	-2.089	***	8.38
TaxAvoid = CETR	0.733	***	9.45	0.663	***	8.33
Inf	-0.611		0.22	1.319		1.30
TaxAvoid*Inf	-0.812	**	3.35	-0.794	**	3.98
Cash	-0.813	*	2.65	-0.633		1.42
MtB	0.066	**	3.35	0.117	***	7.32
ROA	1.744	*	1.77	1.229		0.68
Leverage	-0.311		0.11	-0.023		0.00
Dividend	-0.082		0.12	-0.742	***	5.75
Size	-0.324	***	10.98	-0.278	***	8.53
stdSale	-0.536	*	2.41	0.318		0.67
stdInvest	2.511	***	7.92	-1.352	*	2.05
stdROA	0.332		0.02	1.739		0.58
InstiOwn	1.035	**	3.39	1.265	***	5.64
Inf*Cash	2.122	**	5.19	0.934		1.11
Inf*MtB	-0.087		1.39	-0.157	**	5.22
Inf*ROA	-1.294		0.22	0.386		0.02
Inf*Leverage	1.207		0.51	0.188		0.02
Inf*Dividend	0.005		0.00	1.159	***	6.68
Inf*Size	0.161		0.82	0.105		0.45
Inf*stdSale	0.863		1.47	-0.850		1.54
Inf*stdInvest	-3.343	**	3.91	3.515	**	4.67
Inf*stdROA	-1.968		0.18	-1.874		0.20
Inf*InstiOwn	-0.311		0.09	-1.211	*	1.67
Industry Fixed Effects		Included			Included	
Year Fixed Effects		Included			Included	
Psuedo-R^2		13.4			13.6%	
N		6,598			6,598	

This table shows the results of adopting the propensity-score matching method to examine the association among the investment level, tax avoidance and the quality of the information environment. Tax avoidance (*TaxAvoid*) is measured as *CETR*. Coefficients are presented with t-statistics based on firm-clustered standard errors. ***, ** and * denote significance at the 1, 5, and 10 percent levels, for one-tailed tests where there are predictions and two-tailed tests otherwise All variables are defined in *Appendix* A.

TABLE 7
Change Specification Analysis:

Panel A: Investment, Tax Avoidance, and the Quality of the Information Environment

The regression model is:

$$\Delta Invest_{i,t+1} = \beta_0 + \beta_1 \Delta TaxAvoid_i + \beta_2 \Delta Inf_i + \beta_3 \Delta TaxAvoid*\Delta Inf_{i,t} + \beta_4 \Delta Cash_{i,t} + \beta_5 \Delta MtB_{i,t} + \beta_6 \Delta ROA_{i,t} + \beta_7 \Delta Leverage_{i,t}$$
$$+ \beta_8 \Delta Dividend_{i,t} + \beta_9 \Delta Size_{i,t} + \beta_{10} \Delta StdSales_{i,t} + \beta_{11} \Delta StdSales_{i,t} + \beta_{12} \Delta StdInv_{i,t} + \beta_{13} \Delta StdROA_{i,t} + \beta_{14} \Delta InstiOwn_{i,t}$$
$$+ \beta_{15} Inf*\Delta Cash_{i,t} + \beta_{16} \Delta Inf_{i,t}*\Delta MtB_{i,t} + \beta_{17} \Delta Inf_{i,t}*\Delta ROA_{i,t+1} + \beta_{18} \Delta Inf_{i,t}*\Delta Leverage_{i,t} + \beta_{19} \Delta Inf_{i,t}*\Delta Dividend_{i,t}$$
$$+ \beta_{20} \Delta Inf_{i,t}*\Delta Size_{i,t} + \beta_{21} \Delta Inf_{i,t}*\Delta StdSales_{i,t} + \beta_{22} \Delta Inf_{i,t}*\Delta StdSales_{i,t} + \beta_{23} \Delta Inf_{i,t}*\Delta StdInv_{i,t}$$
$$+ \beta_{24} \Delta Inf_{i,t}*\Delta StdROA_{i,t} + \beta_{25} \Delta Inf_{i,t}*\Delta InstiOwn_{i,t} + \Sigma Industry_i + \Sigma Year + \varepsilon_{i,t}$$

	TaxAvoid= $CETR_t$						TaxAvoid= $GAAPETR_t$					
	(1)			(2)			(3)			(4)		
	$\Delta Inf = \Delta Inf\_FRQ$			$\Delta Inf = \Delta Inf\_ANA$			$\Delta Inf = \Delta Inf\_FRQ$			$\Delta Inf = \Delta Inf\_ANA$		
	coeff		t-stat	coeff		t-stat	coeff		t-stat	coeff		t-stat
Intercept	-0.005		-0.54	-0.004		-0.43	-0.006		-0.59	0.008		0.28
ΔTaxAvoid	0.050	***	3.08	0.029	**	1.98	0.042	**	1.68	0.055	*	1.60
ΔInf	0.007		0.87	0.000		0.07	0.009		1.24	0.025	**	2.28
ΔTaxAvoid*ΔInf	-0.073	***	-2.44	-0.040	**	-1.70	-0.097	**	-2.14	-0.146	**	-2.23
ΔCash	0.103	***	3.88	0.134	***	4.38	0.102	***	6.32	0.161	***	5.43
ΔMtB	0.005	**	2.32	0.004	**	1.81	0.005	***	3.01	0.002		0.87
ΔROA	-0.014		-0.24	0.073	*	1.55	0.004		0.10	0.220	***	3.21
ΔLeverage	-0.346	***	-6.31	-0.367	***	-7.00	-0.359	***	-8.26	-0.201	***	-3.07
ΔDividend	-0.007		-1.02	-0.013	**	-1.93	-0.010		-1.27	-0.009		-0.73
ΔSize	-0.282	***	-13.21	-0.330	***	-14.98	-0.276	***	-18.81	-0.310	***	-11.84
ΔstdSale	0.066	**	2.29	0.032		1.07	0.056	***	2.42	-0.017		-0.41
ΔstdInvest	-0.734	***	-8.10	-0.833	***	-8.59	-0.690	***	-12.15	-0.860	***	-9.22
ΔstdROA	0.148		0.98	0.329	***	2.37	0.107		0.92	0.533	***	2.95
ΔInstiOwn	0.082	**	2.32	0.039		1.12	0.093	***	3.16	0.126	***	2.65
ΔInf*ΔCash	-0.040		-0.92	-0.004		-0.07	-0.044	*	-1.59	-0.114	**	-2.10
ΔInf*ΔMtB	-0.001		-0.23	0.001		0.32	-0.001		-0.39	0.001		0.14
ΔInf*ΔROA	0.041		0.40	-0.138	*	-1.53	0.023		0.30	-0.400	***	-3.03
ΔInf*ΔLeverage	-0.063		-0.61	-0.030		-0.35	-0.043		-0.54	-0.294	***	-2.40
ΔInf*ΔDividend	0.001		0.04	0.016	*	1.42	0.007		0.44	0.008		0.35
ΔInf*ΔSize	0.004		0.09	0.070	**	1.88	-0.004		-0.14	0.024		0.49
ΔInf*ΔstdSale	-0.021		-0.41	0.036		0.69	-0.006		-0.15	0.146	**	1.87
ΔInf*ΔstdInvest	0.158		0.93	0.220	*	1.35	0.091		0.86	0.490	***	2.77
ΔInf*ΔstdROA	0.037		0.14	-0.438	**	-1.76	0.087		0.42	-0.726	**	-2.06
ΔInf*ΔInstiOwn	-0.019		-0.30	-0.007		-0.12	-0.039		-0.73	-0.091		-1.05
Industry Fixed Effects	Included			Included			Included			Included		
Year Fixed Effects	Included			Included			Included			Included		
Joint Significance Test: $\beta_1+\beta_3=0$	2.07*			0.66			4.65**			6.35***		
Adj. R²	30.4%			33.0%			30.0%			30.0%		
N	14,177			14,319			14,177			14,319		

TABLE 7
Change Specification Analysis:

Panel B: Overinvestment, Tax Avoidance, and the Quality of the Information Environment

The regression model is:

$$Switch = \beta_1 \Delta TaxAvoid + \beta_2 \Delta Inf + \beta_3 \Delta TaxAvoid*\Delta Inf + Controls$$

	TaxAvoid=CETR						TaxAvoid=GAAPETR					
	(1)			(2)			(3)			(4)		
	Inf=Inf_FRQ			Inf=Inf_ANA			Inf=Inf_FRQ			Inf=Inf_ANA		
	Coeff		Chi-Squared	Coeff		Chi-Squared	Coeff		Chi-Squared	Coeff		Chi-Squared
Intercept	1.202	***	9.35	1.595	**	4.04	1.125	***	8.39	1.181	*	2.60
ΔTaxAvoid	1.572	**	4.14	1.547	**	3.41	2.381	**	4.07	2.342	**	3.37
ΔInf	-0.776	**	3.54	0.134		0.09	-0.647	*	2.52	0.031		0.01
*ΔTaxAvoid*ΔInf*	-2.624	**	3.65	-3.273	**	4.09	-4.562	**	4.35	-5.516	**	5.10
ΔCash	5.760	***	24.18	2.196	**	3.94	5.886	***	25.59	2.017	**	3.39
ΔMtB	0.081		1.04	0.108		1.26	0.103	*	1.66	0.099		1.05
ΔROA	1.690		0.56	2.543		1.26	1.793		0.65	3.513	*	2.37
ΔLeverage	-9.503	***	15.47	-6.215	***	6.01	-9.407	***	15.65	-6.142	***	5.89
ΔDividend	0.096		0.04	-0.023		0.00	-0.069		0.02	-0.143		0.09
ΔSize	-8.982	***	74.57	-6.642	***	32.48	-8.491	***	69.34	-6.644	***	32.95
ΔstdSale	0.017		0.00	-2.043	*	1.96	0.227		0.03	-2.226	*	2.36
ΔstdInvest	-5.235	*	2.59	-3.737		1.01	-5.000	*	2.49	-3.662		1.02
ΔstdROA	4.473		0.50	21.882	***	10.31	-0.024		0.00	21.860	***	10.37
ΔInstiOwn	-1.156		0.56	2.174	*	1.95	-1.022		0.45	2.282	*	2.18
*ΔInf*ΔCash*	-2.983	*	2.27	1.388		0.45	-3.212	*	2.67	1.179		0.33
*ΔInf*ΔMtB*	0.079		0.29	-0.015		0.01	0.027		0.04	-0.025		0.02
*ΔInf*ΔROA*	-9.155	**	5.22	-7.442	**	2.92	-9.362	***	5.50	-9.145	**	4.35
*ΔInf*ΔLeverage*	5.800	*	1.77	-0.746		0.02	5.802	*	1.82	-0.826		0.03
*ΔInf*ΔDividend*	-0.649		0.47	-0.129		0.02	-0.288		0.09	0.124		0.02
*ΔInf*ΔSize*	3.529	**	3.59	-0.519		0.06	2.858	*	2.42	-0.221		0.01
*ΔInf*ΔstdSale*	0.623		0.08	6.029	**	4.58	0.368		0.03	6.344	**	5.13
*ΔInf*ΔstdInvest*	-3.034		0.25	-4.118		0.33	-3.189		0.29	-3.563		0.26
*ΔInf*ΔstdROA*	-1.944		0.03	-40.208	***	9.05	3.849		0.12	-41.536	***	9.67
*ΔInf*ΔInstiOwn*	4.192	*	2.17	-1.072		0.14	4.112	*	2.14	-1.206		0.18
Industry Fixed Effects	Included			Included			Included			Included		
Year Fixed Effects	Included			Included			Included			Included		
Psuedo-R²	32.0%			30.4%			31.5%			29.8%		
N	2,320			2,393			2,320			2,393		

Panel A shows the results of estimating Model (1) after first-differencing to examine whether increased investment arises from increased tax avoidance and the quality of the information environment deters this relation. The dependent variable $\Delta Invest_{t+1}$ is the one-year ahead change in investment ($Invest_{t+1}-Invest_t$). $\Delta TaxAvoid$ is equal to the change in the annual $\Delta CETR$ ($\Delta GAAPETR$) for year t ($CETR_t - CETR_{t-1}$) or ($GAAPETR_t - GAAPETR_{t-1}$). We multiply the annual change in $\Delta CETR$ ($\Delta GAAPETR$) by negative one so that a greater value represents a larger increase in tax avoidance. The change in the quality of the information environment (ΔInf) is proxied using ΔInf_FRQ (in columns 1 and 3) and ΔInf_ANA (in columns 2 and 4). The information environment measures are not normally distributed when differenced (the p-value of Kolmogorov-Smirnov test for the investment efficiency measures is less than 0.01), therefore, we use the percentile ranks of the first differences for these proxies. In Panel B, the dependent variable, *Switch*, is a dummy variable, equal to one for firms switching from the benchmark group (*Normal*) to the over-investing group (*Over*), and zero for firms that switch from *Over* to *Normal*. Firms that do not switch from one group to another group are excluded. *TaxAvoid* is equal to the change in the annual $\Delta CETR$ ($\Delta GAAPETR$) for the year t ($CETR_t - CETR_{t-1}$) or ($GAAPETR_t - GAAPETR_{t-1}$). We multiply the annual change in $\Delta CETR$ ($\Delta GAAPETR$) by negative one so that a greater value represents a larger increase in tax avoidance. The change in the quality of the information environment (ΔInf)

is proxied using Δ*Inf_FRQ* (in columns 1 and 3) and Δ*Inf_ANA* (in columns 2 and 4). Coefficients are reported using *t*-statistics based on firm-clustered standard errors. ***, ** and * denote significance at the 1, 5, and 10 percent levels, for one-tailed tests where there are predictions and two-tailed tests otherwise. All variables are as defined in *Appendix A*.

TABLE 8
Robustness Check on Restricted Sample with Available G-index

Panel A: Investment, Tax Avoidance, and the Quality of the Information Environment

The regression model is:

$$Invest_{i,t}=\beta_0+\beta_1TaxAvoid_{i,t-1}+ \beta_2Inf_{i,t-1}+\beta_3TaxAvoid*Inf_{i,t-1}+\beta_4Cash_{i,t}+\beta_5MtB_{i,t}+\beta_6ROA_{i,t}+\beta_7Leverage_{i,t}+\beta_8Dividend_{i,t}+\beta_9Size_{i,t}+\beta_{10}StdSales_{i,t}+\beta_{11}StdSales_{i,t}$$
$$+\beta_{12}StdInv_{i,t}+\beta_{13}StdROA_{i,t}+\beta_{14}G_{i,t}+\beta_{15}InstiOwn_{i,t} +\beta_{16}Inf*Cash_{i,t}+\beta_{17}Inf*MtB_{i,t}+\beta_{18}Inf*ROA_{i,t}+\beta_{19}Inf*Leverage_{i,t}+\beta_{20}Inf*Dividend_{i,t}$$
$$+\beta_{21}Inf*Size_{i,t}+\beta_{22}Inf*StdSales_{i,t} +\beta_{23}Inf*StdSales_{i,t}+\beta_{24}Inf*StdInv_{i,t}+\beta_{25}Inf*StdROA_{i,t}+\beta_{26}Inf*G_{i,t}+\beta_{27}Inf*InstiOwn_i+\Sigma Industry_i+\Sigma Year_t+\varepsilon_{i,t} \qquad (1)$$

	TaxAvoid = CETR						TaxAvoid = GAAPETR					
	(1)			(2)			(3)			(4)		
	Inf = Inf_FRQ			Inf = Inf_ANA			Inf = Inf_FRQ			Inf = Inf_ANA		
	Coeff.		t-stat	Coeff.		t-stat	Coeff.		t-stat	Coeff.		t-stat
Intercept	0.155	***	7.59	0.168	***	8.91	0.155	***	7.56	0.147	***	6.41
TaxAvoid	0.032	***	5.93	0.030	***	6.88	0.014	***	2.60	0.036	***	4.86
Inf	-0.010		-0.43	0.026		1.18	-0.012		-0.53	0.123	***	3.27
*TaxAvoid*Inf*	-0.015	**	-2.21	-0.017	***	-2.80	-0.012	**	-1.75	-0.020	*	-1.48
Cash	0.023	**	1.75	0.020	**	1.78	0.028	**	2.11	-0.010		-0.40
MtB	0.002	***	2.83	0.002	**	2.30	0.003	***	3.02	0.006	***	3.57
ROA	0.177	***	5.59	0.170	***	5.92	0.168	***	5.24	0.132	***	2.90
Leverage	-0.038	**	-1.66	-0.060	***	-3.72	-0.037	*	-1.61	-0.071	***	-2.42
Dividend	0.000	**	-2.28	0.000	**	-2.02	0.000	***	-2.81	0.001	**	2.03
Size	-0.013	***	-7.94	-0.015	***	-10.35	-0.013	***	-7.92	-0.010	***	-4.23
stdSale	-0.025	***	-3.51	-0.003		-0.30	-0.026	***	-3.66	-0.016	*	-1.62
stdInvest	0.092	***	3.34	0.106	***	4.39	0.095	***	3.43	0.043	*	1.43
stdROA	0.171	***	2.39	0.042		0.58	0.194	***	2.70	0.030		0.40
G	0.046		0.98	0.027		0.72	0.047		1.01	-0.108	***	-2.45
InstiOwn	0.049	***	4.05	0.050	***	4.90	0.053	***	4.41	0.050	***	3.26
*Inf*Cash*	-0.009		-0.43	0.005		0.25	-0.010		-0.47	0.028		0.63
*Inf*MtB*	0.000		-0.11	0.000		-0.28	0.000		-0.14	-0.006	**	-2.23
*Inf*ROA*	-0.010		-0.21	0.036		0.83	-0.014		-0.29	0.019		0.22
*Inf*Leverage*	-0.035		-1.27	0.028		1.15	-0.033		-1.22	0.066		1.22
*Inf*Dividend*	0.000		0.23	0.000	*	-1.61	0.000		0.53	-0.003	***	-2.51

	(1)			(2)			(3)			(4)		
Inf*Size	0.005	***	2.58	0.000		0.25	0.006	***	2.69	-0.010	**	-2.27
Inf*stdSale	0.031	**	2.15	-0.015		-1.28	0.031	**	2.17	-0.002		-0.12
Inf*stdInvest	-0.049	*	-1.39	-0.035		-1.15	-0.049	*	-1.39	0.122	**	2.10
Inf*stdROA	-0.094		-0.92	0.002		0.02	-0.100		-0.98	-0.038		-0.24
Inf*G	-0.063		-0.95	0.037		0.65	-0.063		-0.94	0.222	***	2.61
Inf*InstiOwn	-0.015		-0.96	-0.036	***	-2.56	-0.015		-0.98	-0.045	**	-1.57
Industry Fixed Effects	Included			Included			Included			Included		
Year Fixed Effects	Included			Included			Included			Included		
Joint Significance Test: $\beta_1+\beta_3=0$	14.6***			10.3***			0.49			4.78**		
Adj. R^2	15.7%			16.8%			15.3%			17.1%		
N	9,808			10,280			9,808			10,280		

TABLE 8
Robustness Check on Restricted Sample with Available G-index

Panel B: Overinvestment, Tax Avoidance, and the Quality of the Information Environment
The regression model is:

$$Overinvest = \beta_1 TaxAvoid + \beta_2 Inf + \beta_3 TaxAvoid*Inf + Controls \qquad (2)$$

		TaxAvoid = CETR						*TaxAvoid = GAAPETR*				
		(1)			*(2)*			*(3)*			*(4)*	
		Inf = Inf_FRQ			*Inf = Inf_ANA*			*Inf = Inf_FRQ*			*Inf = Inf_ANA*	
	Coeff.		Chi-squared	*Coeff.*		Chi-squared	*Coeff.*		Chi-squared	*Coeff.*		Chi-squared
Intercept	-2.600	***	25.28	-1.949	**	4.87	-2.659	***	26.39	-1.788	**	4.05
TaxAvoid	0.535	***	20.89	0.431	***	16.47	0.451	***	12.24	0.280	***	5.63
Inf	-0.268		0.23	0.279		0.32	-0.267		0.23	0.008		0.00
*TaxAvoid*Inf*	-0.310	**	3.35	-0.297	**	4.24	-0.393	**	4.37	-0.258	*	2.52
Cash	-0.154		0.51	-0.074		0.20	-0.122		0.32	0.179		1.05
MtB	-0.090	***	13.99	-0.026	*	2.08	-0.088	***	13.39	-0.056	***	5.59
ROA	6.345	***	95.27	4.961	***	70.96	6.328	***	93.48	5.866	***	85.59
Leverage	4.177	***	84.58	3.175	***	68.72	4.182	***	84.81	3.374	***	72.67
Dividend	-0.001		0.00	-0.001		0.01	-0.002		0.02	0.005		1.32
Size	-0.242	***	24.13	-0.230	***	23.06	-0.243	***	24.25	-0.239	***	24.69
stdSale	-0.441	***	6.85	-0.607	***	11.26	-0.445	***	6.94	-0.552	***	9.39
stdInvest	4.973	***	128.29	5.285	***	196.16	5.030	***	131.39	5.992	***	223.79
stdROA	0.061		0.00	0.038		0.00	0.057		0.00	-1.563		1.64
G	0.551		0.33	-0.105		0.01	0.695		0.52	-0.051		0.00
InstiOwn	0.860	***	9.18	0.749	***	8.90	0.940	***	10.97	0.690	***	6.76
*Inf*Cash*	-0.054		0.03	0.437	**	4.42	-0.042		0.02	-0.015		0.00
*Inf*MtB*	0.066	**	4.84	-0.057	**	4.62	0.065	**	4.74	0.004		0.02
*Inf*ROA*	0.263		0.07	2.065	***	6.51	0.123		0.02	0.325		0.15
*Inf*Leverage*	-0.855	*	1.98	0.361		0.50	-0.866	*	2.03	0.364		0.49
*Inf*Dividend*	0.010		0.57	0.009		0.44	0.011		0.59	0.027		0.33
*Inf*Size*	0.026		0.16	-0.065		1.20	0.032		0.24	-0.039		0.43
*Inf*stdSale*	-0.449	*	2.40	0.038		0.03	-0.461	*	2.52	0.187		0.70
*Inf*stdInvest*	0.731		1.48	-0.396		0.64	0.684		1.30	-1.775	***	12.36
*Inf*stdROA*	0.693		0.14	-0.184		0.01	1.021		0.30	1.766		1.26

*Inf*G*	-1.268	0.75	0.238	0.03	-1.425	0.96	0.625	0.23
*Inf*InstiOwn*	0.099	0.07	0.017	0.00	0.084	0.05	0.361	1.23
Industry Fixed Effects	Included		Included		Included		Included	
Year Fixed Effects	Included		Included		Included		Included	
Psuedo-R^2	11.5%		10.5%		18.6%		15.4%	
N	15,920		20,292		15,845		20,689	

This table shows the results on a restricted sample with data available for G-index, which we use as another control variable for corporate governance. Panel A shows the results of estimating Model (1) including G-index (*G*) and its interaction term with *Inf* (*Inf*G*). Tax avoidance (*TaxAvoid*) is measured as *CETR* or *GAAPETR*. The quality of the information environment (*Inf*) is measured as *Inf_FRQ* or *Inf_ANA*. Panel B shows the results from a multinomial logistic regression Model (2) including G-index (*G*) and its interaction term with *Inf* (*Inf*G*). The results are from the comparison between overinvestment and normal investment. Coefficients are presented with t-statistics based on firm-clustered standard errors. ***, ** and * denote significance at the 1, 5, and 10 percent levels, for one-tailed tests where there are predictions and two-tailed tests otherwise. All variables are defined in *Appendix* A.