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Corporate Tax Planning and Firms' Information Environment

Abstract

This study examines whether internal information quality (IIQ) is associated with firms' external information quality (EIQ) and whether tax planning moderates this association. Based on the argument that higher internal information quality allows managers to convey higher quality information to market participants, I hypothesize and find a positive association between IIQ and EIQ. I then examine if tax planning, which prior literature shows affects external information quality due to proprietary costs of disclosure, attenuates this association. I find that the association between IIQ and EIQ is fully attenuated for firms with a high level of tax planning. A structural equation model that allows different elements of IIQ to covary and robustness tests corroborate my findings. Overall, my results imply that increased IIQ spills over to EIQ because managers convey higher quality internal information to market participants. However, proprietary costs resulting from a high level of tax planning appear to moderate this effect.

Keywords: External information quality; information asymmetry; information environment; internal information quality; tax avoidance; tax planning

JEL-Classification: G30; H26; M41.

1. Introduction

I investigate whether firms' internal information quality (IIQ) is associated with external information quality (EIQ) and whether tax planning moderates this association.[1] I define IIQ as the ability of managers to collect and use data and knowledge within the organization more efficiently; and EIQ as the degree of information asymmetry to market participants (Gallemore and Labro 2015; Balakrishnan, Blouin, and Guay 2018). High EIQ is associated with low information asymmetry and allows market participants to more accurately assess future earnings (Chen, Hepfer, Quinn, and Wilson 2018). Theoretically, IIQ is an antecedent for EIQ and enables managers to convey higher quality information to market participants through disclosure, resulting in lower cost of capital (Hemmer and Labro 2008; Goh, Lim, Lee, and Shevlin 2016; Chen et al. 2018a). Hence, I predict a positive association between IIQ and EIQ.

The positive association between IIQ and EIQ rests on the assumption that managers with high internal information quality disclose internally gathered information to market participants. However, prior literature does not directly test this association. In addition, prior literature documents that IIQ is an antecedent for tax planning, resulting in lower effective tax rates (Gallemore and Labro 2015; Laplante, Lynch, and Vernon 2017; McGuire, Rane, and Weaver 2017). Therefore, IIQ not only helps managers to increase EIQ, but it also allows managers to set up complex tax planning structures that recent literature shows increases organizational complexity and results in lower EIQ (Balakrishnan et al. 2018; Chen et al. 2018a). Therefore, I hypothesize that tax planning moderates the positive relation between IIQ and EIQ. Figure 1 illustrates a theoretical model of the proposed relation between IIQ, tax planning, and EIQ.

[1] Following Hanlon and Heitzman (2010), I define tax planning as the reduction of explicit taxes. This definition reflects all transactions that have any effect on the firm's explicit tax liability measured by effective tax rates (ETRs). Hence, a lower ETR indicates a higher level of tax planning.

Firms' changing financial reporting environment and academic literature motivate my study. Recent developments related to the Base Erosion and Profit Shifting (BEPS) Project require Country-by-Country Reporting, which mandates increasing disclosure of financial information about tax planning, suggests regulators are interested in external information quality (OECD 2015; OECD 2017). Managers expressed concerns that the requirement leads not only to additional costs of gathering and complying with disclosure requirements through things such as tax risk management systems but also to proprietary costs by disclosing information to competitors and tax authorities (EY 2017; Hoopes, Robinson, and Slemrod 2018). A recent survey by E&Y indicates that 55% of the surveyed managers are concerned about the increasing costs of additional tax disclosure requirements (e.g., to market participants and stakeholders). Managers indicated disclosure of tax planning activities also shapes the design of internal control mechanisms (E&Y 2017). Additional evidence is provided by a concurrent survey study by Bruehne and Schanz (2018) that identifies disclosure about tax planning as a key consideration for the design of internal control mechanisms and communication with stakeholders.

Recent calls of academic literature to investigate costs and benefits of tax planning more holistically also motivate my study (Hanlon and Heitzman 2010; Wilde and Wilson 2018). I investigate whether IIQ improves EIQ to the same extent when tax planning is high compared when tax planning is low. Specifically, I examine the interaction of firms' capability of setting up tax planning structures as reflected in IIQ and the consequences on its information environment to market participants, or EIQ. Using both internal and external dimensions of the information environment allows me to investigate whether managers of firms that have the internal capabilities to implement complex planning structures convey related information to market participants (Hemmer and Labro 2008; Robinson and Schmidt 2013; Goh et al. 2016;

Inger, Meckfessel, Zhou, and Fan 2017; Balakrishnan et al. 2018). Studying these interaction effects is important for understanding the benefits as well as the direct and indirect costs of tax planning that shape managers' decisions (Scholes and Wolfson 1992; Hanlon and Heitzman 2010; Wilde and Wilson 2018).

Using a sample of listed U.S. public firms with financial statement data for fiscal years 1993-2016, I test my first hypothesis that predicts a positive association between IIQ and EIQ. Following recent literature, I use analysts' forecast error, analysts' dispersion, and bid-ask spread to proxy for EIQ (Balakrishnan et al. 2018; Chen et al. 2018a) and earnings announcement speed, management forecast accuracy, and an indicator variable for material weaknesses to proxy for IIQ (Gallemore and Labro 2015; McGuire et al. 2017). Consistent with my first prediction, I find a positive association between IIQ and EIQ using both an ordinary least squares and changes model. While I acknowledge that endogeneity is a concern for the relationship between IIQ and EIQ, the robustness of my results, as well as, the theoretical prediction for the association help to mitigate this concern. Theoretically, it is more likely that managers obscure high quality internal information to market participants because of financial reporting incentives than managers with low internal information quality generate high quality financial reports (Hemmer and Labro 2008; Kim, Song, and Zhang 2009; Heitzman and Huang 2018).

The second hypothesis analyzes the moderating effect of corporate tax planning on the association between IIQ and EIQ. To mitigate concerns about the endogenous relation of internal information environment, organizational complexity, and tax planning, I use an adjusted effective tax rate (ETR) that is constructed within size and industry groupings (Balakrishnan et al. 2018). This adjusted measure captures variation in tax planning within firms that are subject to a similar planning and business coordination environment. Using a fully specified model that includes an interaction term between tax planning and IIQ, I find a moderating effect on EIQ for firms with high levels of tax planning but not for firms with low levels of tax planning. This moderating effect alleviates reverse causality concerns that EIQ causes IIQ because in the presence of reverse causality there is no reason to expect a moderating impact of tax planning. Further, my findings are robust to using different measures for IIQ and EIQ and entropy balancing on covariates such as the relative internal information quality of firms and other firm characteristics in the respective industry-year.

In robustness tests, I address concerns that tax planning is correlated with other proprietary costs of disclosure that are potentially not captured by tax planning and hence a correlated omitted variable. To mitigate this concern, I use abnormal returns on assets commonly used in the literature as a measure for proprietary costs (Cheng 2005; Berger and Hann 2007; Ellis, Fee, Thomas 2012) and interact IIQ with this measure. Consistent with my prediction, I do not find a moderating effect of proprietary costs on the association between IIQ and EIQ. I also use the Sarbanes-Oxley (SOX) Act as a shock to the internal information environment to further strengthen inferences.

In a further robustness test, I address concerns of potentially omitted variables that affect the association between IIQ and EIQ using a structural equation model (SEM) framework. SEM allows independent variables to covary with each other to mitigate potential endogeneity concerns. Using several proxies for IIQ allows me to investigate in detail the latent construct of IIQ and also to investigate the complex interactive effect of IIQ and tax planning. Combined, these results suggest that IIQ is positively associated with EIQ but that this association is fully attenuated for firms with high levels of tax planning.

My findings contribute to several streams of research. First, they add to the literature that investigates the relation between internal and external information environment (Hemmer and Labro 2008; Feng, Li, and McVay 2009; Chen, Martin, Roychowdhury, Wang, and Billet 2018). While prior literature suggests that these two dimensions are associated, I formally test this relation using several proxies for IIQ and EIQ. My findings indicate that the ability to generate higher quality of internal information positively translates to higher quality of external information to market participants and stakeholders (Kim et al. 2009). Further, my study identifies tax planning as an important factor that moderates managers' disclosure of internal information. These findings extend prior literature and provides evidence that tax planning is one form of proprietary costs that moderates the relation between IIQ and EIQ (Ittner and Michels 2017; Heitzman and Huang 2018).

I also add to the literature that explores the relation between tax planning and the information environment (Chen et al. 2018a; Gallemore and Labro 2015; Laplante et al. 2017; McGuire et al. 2017). Specifically, my results shed light on whether managers are unable or unwilling to convey to market participants important information about tax planning (Balakrishnan et al. 2018). While my results indicate that managers of firms with high IIQ on average convey more information to market participants to reduce information asymmetries, my results also indicate that the level of tax planning moderates the disclosed information. This suggests that managers with high levels of tax planning are unwilling to disclose information.

Finally, my study responds to the call from Wilde and Wilson (2018) to examine costs and benefits of tax planning holistically because most prior studies investigate determinants of tax avoidance in isolation. I provide evidence on the interaction of two previously separately investigated tax planning determinants that shape managers' decisions and outcomes for investors. I provide evidence that high levels of tax planning increase information asymmetries to market participants if internal capabilities (IIQ) are high. Consequently, market participants face costs through increased tax planning if internal planning capabilities are high because EIQ does not increase in IIQ for firms with a high level of tax planning. Studying these interaction effects is important to understand the direct and indirect costs of tax planning that shape managers' decisions and outcomes for investors (Scholes and Wolfson 1992; Hanlon and Heitzman 2010; Robinson and Schmidt 2013; Inger et al. 2017; Wilde and Wilson 2018).

I organize the remainder of this paper as follows. In the next section, I develop my hypotheses based on prior literature. I describe my empirical approach and sample in section 3. Section 4 presents my results and section 5 concludes.

2. Theoretical Background and Hypothesis Development

2.1 Internal and External Information Environment

Several streams of accounting literature document that the information environment is critical for the efficiency of firm's operations because it facilitates internal decisions, increases firm value, and mitigates potential information asymmetries to its shareholders and potential investors (Coase 1937). The information environment of the firm consists of both an internal (collection and use of data within one firm) and external information environment (disclosure of information to market participants). Prior literature suggests that these two dimensions are interrelated (e.g., Frankel and Li 2004; Hemmer and Labro 2008; Dichev, Graham, Harvey, and Rajgopal 2013) and that managers consider both dimensions jointly.

Management accounting literature provides evidence that high IIQ leads to improved coordination (Bushman, Indjejikian, and Smith 1995) and managerial decision-making (Hemmer and Labro 2008). High IIQ allows managers to collect, use, and provide more timely accounting information (Galbraith 1974; Chenhall and Morris 1986; Brazel and Dang 2008). This is important for internal decisions because it reduces information asymmetries within firms and increases the ability of managers to forecast earnings (Ittner and Michels 2017). Consistent with these findings, recent studies document a positive association between IIQ and capital budgeting as well as investment efficiency (Graham et al. 2015; Heitzman and Huang 2018). This positive effect of internal information asymmetry is more pronounced in environments with higher organizational complexity because IIQ is crucial for resource allocation (Bushman, Chen, Engel, and Smith 2004; Shroff, Verdi, and Yu 2014).

Internal information quality not only positively affects the internal use of data but also allows managers to provide higher quality external accounting information and disclosure of estimates to market participants, such as voluntarily disclosed management earnings forecasts (Feng, Li, and McVay 2009; Samuels 2016; Ittner and Michels 2017). Prior literature also documents that low IIQ proxied as internal control weaknesses are associated with poorer accrual quality (Doyle, Ge, and McVay 2007; Feng, Li, and McVay 2009). While these studies indicate a directional effect of IIQ on EIQ, the findings of Shroff (2017) and Cheng, Cho, and Yang (2018) suggest that changes in external reporting requirements can alter the overall internal information environment that is the basis for managerial decision making. Importantly, these studies use shocks in the external reporting requirements to assess the impact on IIQ. Prior literature indicates that EIQ drives IIQ to some extent but only in settings in which firms are affected by a shock (e.g., adoption of SFAS 142). Nonetheless, it is more likely that managers obfuscate high quality internal information to market participants because of financial reporting incentives than managers are able to generate high quality financial reports and disclosures with low IIQ (Heitzman and Huang 2018).

Although prior literature documents a positive association between IIQ and voluntarily disclosed management forecasts, less is known about the direct effect of IIQ on EIQ in terms of the degree of information asymmetry to market participants. Theoretically, higher IIQ enables managers to convey more information (or higher quality information) to market participants, resulting in a positive association between IIQ and EIQ (Hemmer and Labro 2008). Prior literature documents that increased EIQ is associated with lower cost of capital and improves access to external financing (Diamond and Verrecchia 1991; Baiman and Verrecchia 1996). Based on this rationale, I predict the following:

H1: Internal information quality is positively associated with external information quality.

2.2 The Effect of Tax Planning on the Association between IIQ and EIQ

The hypothesized association between internal information quality and external information quality rests on the assumption that managers do not face costs associated with disclosing information. For example, one such cost is the proprietary costs related to disclosing information. Prior literature documents a positive association of IIQ and tax planning, resulting in lower effective tax rates. Firms with high IIQ are more likely to accurately estimate taxable income, set up complex tax structures and provide information about transfer prices that allow it to shift income into low-tax jurisdictions (Robinson, Sikes, and Weaver 2010; Gallemore and Labro 2015; Chen et al. 2018a; Laplante et al. 2017). The positive effect of IIQ increases in the dispersion of geographical operations and uncertainty of its business environment (McGuire, Rane, and Weaver 2017). Further, firms with a higher IIQ are in a better position to deal with tax authorities by providing more documentation about transactions that lower their effective tax rates (Mills, Erickson, and Maydew 1998). Therefore, IIQ not only helps managers to increase

EIQ (as conjectured in H1), but it also allows managers to set up complex tax planning structures.

Despite the positive effects of tax planning through increased after-tax cash flows, tax planning also induces tax and non-tax costs (Scholes and Wolfson 1992). These costs include agency, implementation, and outcome costs (Wilde and Wilson 2018). Increased organizational complexity and lower corporate transparency are potential implementation and outcome costs of tax planning (Balakrishnan et al. 2018; Chen et al. 2018a; Li, Ma, Omer, and Sun 2018).[2] For example, implementation and outcome costs include information systems, coordination among business units, and potential penalties for tax planning strategies that are found to be inappropriate after tax audits (Bauer 2016; Krenn 2017; Balakrishnan et al. 2018). These costs materialize when market participants (e.g., investors and analysts) cannot reliably assess the economic implications of greater complexity (Chen et al. 2018). As a consequence, corporate transparency decreases and information asymmetry and information costs to market participants increase (Chen et al. 2018a). This leads to lower liquidity and trading volume and increased costs of capital (Leuz and Verrechia 2000; Beatty, Liao, and Weber 2010).

Generally, managers can mitigate information asymmetry by varying the degree of disclosure (Dye 1985; Jung and Kwon 1988; Verrecchia 1983). With respect to tax planning, Inger et al. (2017) document that the firm's disclosure strategy is correlated with its tax avoidance strategy. For example, managers that are unwilling to disclose information about financial and organizational structures that support tax planning so they discontinue geographic

[2] Higher information asymmetry may be due to agency conflicts. However, the findings of Balakrishnan et al. (2018, p. 24) indicate that agency conflicts with managers do not explain the documented negative relation between transparency and tax planning. To mitigate this concern, I control for institutional ownership in all specifications.

earnings disclosure (Hope, Ma, and Thomas 2013).[3] Balakrishnan et al. (2018) find that tax aggressive firms provide more detailed management discussion and analysis (MD&A) sections of the 10-K report to mitigate reduced EIQ. The study suggests that although high IIQ "may facilitate tax avoidance, managers appear unable (or unwilling) to convey to market participants some important information" (Balakrishnan et al. 2018, p. 33). Taken together, prior literature suggests that IIQ facilitates EIQ but only to a certain degree. Firms with higher IIQ convey more information to market participants to reduce information asymmetries but tax planning moderates this relation. Based on this argument, I state the following hypothesis:

H2: Tax planning attenuates the association between internal and external information quality.

3. Research Design and Sample

3.1 Variable Measurement

Consistent with prior research (Gallemore and Labro 2015; Laplante et al. 2017; McGuire et al. 2017; Heitzman and Huang 2018), I use four proxies for IIQ that are publicly observable and capture different aspects of IIQ. First, earnings announcement speed (*EAS*) equals the average number of days between the end of the quarter and the earnings announcement date, divided by 365 and multiplied by negative one.[4] I use *IIQ_EAS* because firms with a high-quality accounting system are capable of quickly integrating information from different parts of the organization which results in higher speed of closing their books (Jennings, Seo, and Tanlu 2015; Gallemore and Labro 2015). Second, I use a composite measure that captures both the speed and accuracy of internal information (*IIQ_EAS_R*). Specifically, I rank

[3] Hope et al. (2013) argue that it is more difficult for uninformed investors (with limited disclosure about tax-motivated income shifting) to disentangle the true source of earnings and to differentiate the growth and persistence implications between foreign and domestic earnings.

[4] In untabulated tests, I also use the number of days between the end of the fiscal year and the earnings announcement date. Results remain unchanged.

EAS into deciles by industry and year, and then scale it from 0.1 to 1.0.[5] If a firm has an error-related restatement in the fiscal year, the IIQ value is set to 0; otherwise the IIQ value is set to the earnings announcement speed decile ranking. Higher values of IIQ imply higher internal information quality relative to industry peers (Laplante et al. 2017; McGuire et al. 2017). Third, management forecast accuracy (*IIQ_MFA*) equals the absolute value of management's last available estimate of earnings per share before fiscal year-end minus the firm's actual earnings per share, divided by the stock price at the end of the year and multiplied by negative one. Prior literature finds evidence that *IIQ_MFA* is positively associated with IIQ and that common errors in management forecasts and accruals are caused by inaccuracies in the internal information available to managers (Cassar and Gibson 2008; Gong et al. 2009). Finally, I use the absence of material weaknesses in controls (*IIQ_No_ICW*), which is an indicator variable equal to zero if the firm reported a SOX Section 404 material weakness in the current fiscal year, and one otherwise. I use *IIQ_No_ICW* because prior literature finds that firms with material weaknesses are likely basing their decisions on stale financial information and business unit information can be untimely and inaccurately reported to headquarters (Feng et al. 2009; Cheng, Goh, and Kim 2018). Each of these variables is constructed such that higher values indicate a higher *IIQ*.

If managers convey more information to market participants because of higher internal information quality, I predict that EIQ increases (which corresponds to a decrease in information uncertainty and information asymmetry). To proxy for EIQ, I use absolute analysts' forecast errors (*AFError*), dispersion in analysts' forecasts (*AFDisp*), and *Bid-Ask Spread* (Balakrishnan et al. 2018; Chen et al. 2018a). The first two measures focus on the information content that

[5] To be consistent with prior literature for this measure I use Fama French 17 industry classification. However, I estimate Equation (1) and (2) in untabulated tests with a measure that uses the Fama French 48 classifications and find consistent results.

market participants obtain from analysts' forecast whereas the third measure takes into account market outcomes directly. Consistent with prior literature, I define *AFError* as the average absolute analysts' forecast error as the absolute value of the difference between the mean analyst estimate of forecasts issued immediately before the fiscal year-end and the actual earnings for that fiscal year, scaled by the price at the end of previous year (Gu and Wu 2003). *AFDisp* is defined as the average of the standard deviation of the analysts' forecasts issued immediately before the fiscal year-end scaled by lagged price (Balakrishnan et al. 2018; Chen et al. 2018a). *Bid-Ask Spread* is the average monthly spread over the three years in which tax aggressiveness measures are calculated (Armstrong et al. 2015; Balakrishnan et al. 2018; Chen et al. 2018a). In prior studies, an *increase* in EIQ corresponds to a *decrease* in *AFError, AFDisp*, and *Bid-Ask Spread*. For ease of interpretation, I construct *EIQ_Error*, *EIQ_Disp*, and *EIQ_BAS* by multiplying the initial EIQ measures by (-1). Hence, an *increase* in any of these three measures corresponds to an *increase* in EIQ.

To mitigate concerns about the endogenous relation of the information environment and tax planning, I follow Balakrishnan et al. (2018) and adjust effective tax rates by industry and size because firms in the same industry and of similar size have similar tax planning opportunities. Consistent with prior literature, I construct the measure in two steps. First, I calculate a three-year GAAP effective tax rate (*GAAP ETR)* (Dyreng, Hanlon, and Maydew 2008). *GAAP ETR* is the sum of the total tax expense of the past three years (*t-2* to *t*) scaled by the sum of the past three years of pre-tax income. I censor the GAAP ETR to be between zero and one. Second, I adjust each firm's three-year *GAAP ETR* by the same period's three-year *GAAP ETR* for the portfolio of firms in the same quintile of total assets and the same industry. Size and industry are sorted independently, and industry is based on the 48 industries defined by

Fama and French (1997). Consequently, the resulting measure *TA_GAAP* captures cross-sectional variation in firms' total tax planning (including timing and permanent differences),[6] and benchmarks a given firm's tax aggressiveness relative to that of similar-sized firms in the same industry. A positive value of *TA_GAAP* implies that a firm has low tax liability that is a consequence of tax planning. I construct another measure, *TA_CASH*, using cash taxes paid for income taxes instead of tax expense (Balakrishnan et al. 2018).[7]

3.2 Research Design

To analyze the relation between IIQ and EIQ (Hypothesis 1), I estimate the following OLS regression model:

$$EIQ_{i,t} = \alpha_0 + \beta_1\, IIQ_{\,i,t} + \sum_k \beta_k\, Controls_{\,i,t} + \sum_j \beta_j\, Industry\ Fixed\ Effects_i + \sum_l \beta_l\, Year\ Fixed\ Effects_t + \varepsilon_{i,t} \quad (1)$$

As previously discussed, the dependent variable *EIQ* is one of the three adjusted measures for EIQ, analyst forecast error (*EIQ_Error*), analyst dispersion (*EIQ_Disp*), or *EIQ_BAS*. I use four proxies for *IIQ* (*EAS, EAS_R* (EAS with adjustment for error restatement), *IIQ_MFA*, *IIQ_No_ICW*). Each of these variables is constructed such that higher values indicate a better IIQ. Hypothesis 1 predicts a *positive* association between IIQ and EIQ (i.e., higher *EIQ_Error, Disp, BAS*) so I expect a *positive* coefficient β_1 on each IIQ proxy.

I include control variables that prior research identifies as drivers for the information environment. To control for an expected positive relation between firm size and the information environment, I include *Size*, the log of total assets. To control for firms' capital structure, I include *Leverage*, the ratio of long-term debt to total assets (Chen et al. 2018a; Chen et al.

[6] To capture changes of permanent and temporary tax planning strategies within firms (Hanlon 2005; Dhaliwal, Huber, Lee, and Pincus 2008), I also control for book-tax differences (see section 3.2).
[7] I follow Balakrishnan et al. (2018) and do not adjust the denominator by special items. In untabulated tests, I modify the denominator by special items and construct *TA_GAAP* and *TA_CASH*. Results remain substantially the same.

2018b). I also include an indicator variable, *Loss*, equal to one if the firm's income before extraordinary items is less than zero in the current year and zero otherwise. Prior literature documents that loss firms have on average lower earnings quality and higher levels of information asymmetry (Hwang, Jan, and Basu 1996). I include *Foreign Income* because analysts face higher information asymmetry to foreign earnings relative to domestic earnings (Bodnar and Weintrop 1997). To control for a relation between firms' growth opportunities and EIQ, I include market-to-book ratio (*MTB*), which is the ratio of the market value of assets to the book value of assets, and firm age (*Age)*, which is the log of the difference between the first year when the firm appears in Compustat and the current year. I include the log of the number of analysts following the firm (*Analyst Following*) to capture the quantity of firms' information production.

To control for organizational complexity, I use Bushman et al.'s (2004) revenue-based Hirfindahl-Hirschman geographic concentration index because more geographically diversified firms are relatively more opaque (Bushman et al. 2004; Chen et al. 2018a). I include a measure for operating volatility because prior literature documents a negative association between sales volatility and accrual quality which negatively affects the precision of forecasts (Dechow and Dichev 2002). I use the standard deviation of annual sales computed over the previous three years to control for operating volatility (*Std Dev of Sales*).

I include *BTD* to control for potential adverse effects of earnings quality on analyst forecast errors (Hanlon 2005; Dhaliwal, Huber, Lee, and Pincus 2008). Prior literature provides evidence that book-tax differences contain information about earnings persistence (Hanlon 2005; Blaylock et al. 2012) and the magnitude of book-tax differences is negatively associated with earnings quality (Dhaliwal et al. 2008; Blaylock et al. 2012). *BTD* is the absolute value of the mean of the past three year's Book-Tax-Difference, which is measured as pre-tax income less estimated taxable income (defined as current federal tax expense grossed up by the maximum federal statutory tax rate (i.e., 35%) plus pre-tax foreign income less the annual change in NOLs) scaled by total assets. I include the percentage to institutional investors (*Institutional Ownership*) to account for potential agency conflicts and differences in bid-ask-spreads (Berger and Hann 2007; Balakrishnan et al. 2018).

An important factor that affects managers' disclosure of internal information to market participants is proprietary costs. Managers face proprietary costs of disclosure if the revelation of business activities that earn high abnormal profits attracts more competition and, hence, reduces the abnormal profits. Managers tend to withhold the segments with relatively high abnormal segment profits when they face proprietary cost motive dominates. I use industry-size adjusted return on assets (*I_ROA*) to measure of abnormal segment profits (Berger and Hann 2003; Cheng 2005; Berger and Hann 2007; Ellis et al. 2012). *I_ROA* is measured at the firm level, the industry adjustment is based on the firm's primary Fama French 48 classification, the size adjustment based on the quintile of the firm within the industry. This is approach is consistent with the adjusted *TA_GAAP* measure.

Finally, I include year and industry-fixed effects to account for year shocks and time-invariant industry characteristics. Unless indicated otherwise, I winsorize all continuous variables at the 1st and 99th percentiles to mitigate the effect of outliers. I estimate heteroscedasticity-robust standard errors clustered by firm and year to account for serial correlation in the data (Petersen 2009; Gow, Ormazabal, and Taylor 2010). Appendix A provides detailed definitions for all variables. I also modify Equation (1) and use a changes model that removes firm-specific fixed effects and potential confounding effects from time-invariant variables. This takes the following form:

$$\Delta EIQ_{i,t} = \alpha_0 + \beta_1 \Delta IIQ_{i,t} + \sum_k \beta_k \Delta Controls_{i,t} + \sum_j \beta_j \, Industry\ Fixed\ Effects_i + \sum_l \beta_l \, Year\ Fixed\ Effects_t + \varepsilon_{i,t} \quad (2)$$

where Δ is the first-difference operator and the firm-level control variables are measured as of *t-1*. The variable specifications are the same as in the Equations (1).

To test whether tax planning moderates the association between IIQ and EIQ (Hypothesis 2), I modify Equation (1) and interact *IIQ* with *TA*:

$$EIQ_{i,t} = \alpha_0 + \beta_1 IIQ_{i,t} + \beta_2 TA_{i,t} + \beta_3 IIQ_{i,t} * TA_{i,t} + \sum_k \beta_k \, Controls_{i,t} + \sum_j \beta_j \, Industry\ Fixed\ Effects_i + \sum_l \beta_l \, Year\ Fixed\ Effects_t + \varepsilon_{i,t} \quad (3)$$

where *IIQ* and *EIQ* are as previously defined and *TA* is either *TA_GAAP* or *TA_CASH*. Consistent with Hypothesis 1, I expect a *positive* coefficient on β_1. For the coefficients on tax planning , I predict a negative coefficient because prior literature indicates that tax planning decreases EIQ. Consistent with the prediction of a moderating effect of tax planning in Hypothesis 2, I predict a negative coefficient on β_3.

3.3 Sample Selection

I obtain data from the Compustat and CRSP databases, earnings announcement and management forecast data from IBES, Section 404 material weakness data from Audit Analytics.[8] Table 1 presents my sample selection procedure. I limit my data collection to fiscal years beginning after December 15, 1992, which is the effective date of adoption of FASB Statement of Financial Accounting Standards No. 109. I include all publicly-traded, U.S.-based

[8] I use detailed and summary files of analyst forecasts from IBES to compute analyst forecast dispersion and forecast errors, respectively.

corporations with necessary, non-missing data to compute the respective information environment and control variables. In addition to requiring non-missing data to compute each variable, I also require that firm-years have positive values for beginning total assets, ending total assets, and the three-year sum of pre-tax book income. Consistent with prior research on internal information environment, I also exclude all financial firms (SIC codes 6000–6999) from the sample because they are subject to a different regulatory environment and face different tax planning incentives.

To estimate Equation (1) and (3), I constrain my sample to firms for which I can compute tax aggressiveness measures, obtain analysts' forecast error estimates, and compute control variables. This results in my main sample of 34,358 firm-year observations. The sample size drops to 29,538 firm-year observations for regressions that involve analyst dispersion metrics because I require at least five error estimates when calculating this metric. My sample size also contracts for regressions using *MFA* and *No_ICW* because management forecasts are disclosed voluntarily and data on material weaknesses (SOX Section 404) are only available after 2002.

< Insert Table 1 here >

4. Results

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for my sample. Overall, the descriptive statistics are comparable to descriptive statistics of prior literature (Gallemore and Labro 2015; McGuire et al. 2017; Balakrishnan et al. 2018). The mean (standard deviation) of *GAAP ETR* and *CASH ETR* is 31.3% (16%) and 25.6% (18.4%), respectively. As in Balakrishnan et al. (2018), the means of both industry-size adjusted measures, *TA_GAAP* and *TA_CASH*, are below zero (-0.041 and -0.017, respectively) and cross-sectional variation is of similar magnitude as for *GAAP ETR* and

CASH ETR.[9] Columns (7) and (8) present descriptive statistics for firms whose *TA_GAAP* is in the fifth (*High TA*) and first quintile (*Low TA*), respectively. T-tests of differences in means indicate that these groups differ in several aspects. Firms with higher tax planning are characterized by lower EIQ but relatively comparable IIQ. However, firms with high tax planning are larger, are more leveraged, and generate more income in foreign countries, and have higher abnormal returns on assets.

< Insert Table 2 here >

Table 3 presents univariate correlations. The positive correlations between EIQ and IIQ proxies provides univariate evidence consistent with Hypothesis 1. In line with Balakrishnan et al. (2018), I find a high correlation between *TA_GAAP* and *TA_CASH* and negative correlations between size and industry-adjusted tax planning measures and EIQ. These measures are, by construction, highly negatively correlated with *GAAP_ETR* and *CASH_ETR*. Both adjusted tax planning measures are positively correlated with the earnings announcement speed proxies but more weakly correlated with *EIQ_MFA* and *No_ICW*. All correlations are generally consistent with prior research (Gallemore and Labro 2015; Balakrishnan et al. 2018). To further provide comfort with my used proxies, I replicate the studies by Gallemore and Labro (2015) and Balakrishnan et al. (2018) and find results of similar magnitudes. Table A.1 presents the results of my replications.

< Insert Table 3 here >

< Insert Table A.1 here >

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[9] Note that the means of the *TA_GAAP* and *TA_CASH* measures are not zero because the measure uses all firms with available ETR data in the Compustat database to estimate three-year ETRs in the size-industry bins. In my final sample, however, firm-year observations that do not allow me to compute all control variables are not included. The distribution of the *TA_GAAP* and *TA_CASH* variables is similar to prior literature.

4.2 Association between IIQ and EIQ

Hypothesis 1 predicts a positive association between IIQ and EIQ. Table 4, Panel A presents results for OLS regressions based on Equation (1). Columns (1) to (4) present the results for *EIQ_Error* as dependent variable, Columns (5) to (8) for *EIQ_Disp*, and Columns (9) to (12) for *EIQ_BAS*. In Columns (1) to (12), the coefficients on *IIQ* are positive and significant ($p < 0.05$) in eleven out of the twelve specifications. This suggests that IIQ is positively associated EIQ, which is consistent with Hypothesis 1.

With respect to control variables, I find that *EIQ_Error* and *EIQ_Disp* decrease by the size of the firm (*Size*), debt (*Leverage)*, and complexity of business operations (*Foreign Income*, *Std Dev. of Sales*, and *Geographic Complexity*) and *Institutional Ownership*. Consistent with prior literature, book-tax-differences (*BTD*) are negatively correlated with EIQ measures (positively with forecast errors and dispersion), indicating that analysts are less able to accurately forecast earnings in the presence of earnings management (Weber 2009; Bratten, Gleason, Larocque, and Mills 2017). These determinants and their respective magnitudes are fairly consistent with prior research (Balakrishnan et al. 2018; Chen et al. 2018a). Overall, the coefficients on *EIQ_Disp* are of relatively greater magnitude than on *EIQ_Error* which is consistent with prior literature that provides evidence for a bigger variation in *AFDisp* (Gu and Wu 2003; Balakrishnan et al. 2018). The estimated effects are economically meaningful. Results and control variables are similar for *EIQ_BAS*, except for *Size* and *BTD*.

Panel B presents the results for a changes model based on Equation (2). The changes model indicates significant coefficients for nine out of twelve specifications proxies (at the 10% significance level), providing additional support for Hypothesis 1. Economic magnitudes are somewhat smaller than in my previous estimations but still meaningful. The coefficients on *Δ*

No_ICW, are less pronounced (significant at the 10% level) but not significant at the conventional levels. One reason for the less pronounced findings is the potential time lag of internal control weaknesses (not only one period) affecting other financial metrics (Kim et al. 2009). Taken together, my results indicate a positive association between IIQ and EIQ, which is consistent with Hypothesis 1.

< Insert Table 4 here >

4.3 Moderating Effect of Tax Planning on Association between IIQ and EIQ

Hypothesis 2 predicts a moderating effect of tax planning on the association between IIQ and EIQ. To test Hypothesis 2, I use Equation (3) that interacts *TA_GAAP* (*TA_CASH*) with *IIQ_EAS*. For this test and all following tests, I use *EIQ_Error* as dependent variable and *IIQ_EAS* as a proxy for IIQ. Table 5, Panel A presents the results for *TA_GAAP* as a proxy for tax planning. Column 1 (2) presents results for a model that only includes *TA_GAAP* (*IIQ_EAS*). The coefficients on *TA_GAAP* and *IIQ_EAS* take the expected signs and are significant. The same holds for Column 3 in which I include *TA_GAAP* and *IIQ_EAS* but not the interaction of these. Column 4 presents results for the fully specified model. Consistent with Hypothesis 1, I find a positive coefficient on *IIQ_EAS* that is significant ($p < 0.01$). However, the coefficient on *TA_GAAP* is not significant in this specification. Further, the interaction term of *TA_GAAP* and *IIQ_EAS* is positive but not statistically significant. These results suggest that, on average, IIQ is positively associated with EIQ and tax planning does not affect this association.

To investigate in detail the hypothesized relation, I create two subsamples based on the level of tax planning. I classify firms that are in the fifth quintile of *TA_GAAP* (*TA_CASH*) as firms with a high (*High TA=1*) and low level *(Low TA=1*) of tax planning. For each subsample, I estimate OLS regressions based on Equation (3). Column 5 presents the results for *High TA=1*.

Consistent with Hypothesis 2, the coefficient on the interaction on *TA_GAAP*IIQ_EAS* is negative and significant ($p < 0.10$). Column 6 presents the results for low tax planning firms *(Low TA=1*). The coefficient on *TA_GAAP*IIQ_EAS* is negative, but insignificant ($p > 0.10$). Next, I test whether the interaction of *TA_GAAP*IIQ_EAS* moderates the association between IIQ and EIQ using an F-test (*IIQ_EAS + TA_GAAP*IIQ_EAS = 0*). For firms with *High TA=1,* the results of the F-tests indicate that it fully moderates the positive association (P > F = 0.197), resulting in an overall negative impact of IIQ on EIQ. For firms with *Low TA=1*, I reject the null that the combined effect of *EAS + TA_GAAP*IIQ_EAS* equals zero (P > F = 0.028). However, I test and find that the coefficient on *TA_GAAP*IIQ_EAS* in Column 5 is larger than in Column 6 ($p = 0.004$). Taken together, these results support Hypothesis 2 and suggest that the association between IIQ and EIQ is moderated for firms with high levels of tax planning.

Next, I re-estimate Equation (3) using *TA_CASH* instead of *TA_GAAP*. Table 5, Panel B presents the results for my full sample (Columns 1 to 4) and Columns 5 and 6 for firms with *High TA=1* and *Low TA=1*, respectively. Overall, the results in Columns 1 to 4 are comparable to the previous results but I find neither a significant coefficient on *TA_GAAP*IIQ_EAS* for *High TA=1* nor for *Low TA=1*. Again, I test whether the coefficient on *TA_GAAP*IIQ_EAS* in Column 5 is larger than in Column 6 but do not find support for this at conventional levels ($p = 0.110$). The less pronounced moderating effect of tax planning is in line with prior literature that provides evidence on the primacy of the firm's GAAP ETR as the most important tax metric to management (Graham, Hanlon, Shevlin, and Shroff 2014; Armstrong et al. 2015; Flagmeier, Müller, and Sureth-Sloane 2017; Bird, Edwards, and Ruchti 2018).

To further investigate my predictions in Hypothesis 2 and address concerns about the significant differences in covariances (i.e., *IIQ_EAS),* I repeat the tests above using entropy balancing. Specifically, this approach controls for potential functional form misspecification between firms with high level of tax planning and firms with low tax planning. Entropy balancing uses an iterative process to reweight sample observations to reduce the imbalance in the covariate distribution observed in my descriptive statistics (Hainmueller 2012; McMullin and Schonberger 2018). The entropy balanced covariates include all control variables as well as the respective quintile of IIQ to account for differences in the distribution of all covariates. I present descriptive statistics of these covariates before and after entropy balancing in Panel C of Table 5. None of the covariates show significant differences in means across the two conditions (*High TA_GAAP* = 1 and *Low TA_GAAP* =1), indicating a reduction of the in the covariate imbalances. Table 5, Panel D presents the results for my multivariate analyses using the entropy balanced sample. To compare observations of low and high level of tax planning (High *TA_GAAP* = 1 and *Low TA_GAAP* =1), I define *High TA_GAAP* as all observations that are in the fifth quintile of the size- and industry-adjusted TA_GAAP measure and zero if they are in the first quintile. In line with my predictions, coefficients on *High TA _GAAP* are negative, coefficients on *IIQ_EAS* are positive. Consistent with Hypothesis 2, I find a negative interaction term of the two variables (*High TA _GAAP*IIQ_EAS*) for all three EIQ proxies.

Taken together, these tests support Hypothesis 2 and suggest that tax planning moderates the association between IIQ and EIQ. In addition, I repeat all specifications and exclude observations which are based on *GAAP ETR*s computed to zero or one to address concerns that my results are driven by the construction of the measures.

< Insert Table 5 here >

4.4 Robustness Tests

4.4.1 Role of Proprietary Costs

I conduct three robustness tests to assess whether alternative explanations affect my results. First, I bifurcate the sample into firm-year observations below (Table 6, Column 1) and above (Table 6, Column 2) the median of the *I_ROA* and re-estimate Equation (3). This test aims to control for other proprietary costs and isolate tax-related proprietary costs. Firms with high levels of tax planning (low effective tax rates) face additional disclosure costs through increased tax audits.[10] If managers face high proprietary costs, their willingness to convey information to market participants decreases (Berger and Hann 2003). Specifically, Robinson and Schmidt (2013) document that tax planning induces proprietary costs through disclosing uncertain tax positions.

Table 6 shows results for the modified regression using Equation (3). Importantly, the coefficient for the interaction of *TA_GAAP* and *IIQ_EAS* is only significant in Column 1 and not in Column 2. This indicates that other proprietary costs do not explain the moderating effect of tax planning on the relationship of IIQ and EIQ as documented above. While the insignificant coefficient on the interaction term of *TA_GAAP* and *IIQ_EAS* does not provide support for an alternative explanation of Hypothesis 2, it does not allow me to conclude that other proprietary costs are not relevant for this relation. Rather, I interpret my findings that tax planning is a proxy for proprietary costs that is less noisy than the industry- and size-adjusted ROA proxy (*I_ROA*) in this setting.

< Insert Table 6 here >

[10] For example, Google reduced the number of disclosed affiliates with material operations from 102 to 3 after the 10-K Exhibit 21 showed the locations of tax shelter countries (Gramlich and Whiteaker-Poe 2013).

4.4.2 Sarbanes-Oxley Act (SOX) as Shock to IIQ

To provide further evidence on the moderating effect of tax planning on the relation between IIQ and EIQ, I examine changes in EIQ after the enactment of SOX. As documented in prior literature, the act required firms to assess the adequacy of their internal controls on financial reporting and disclosure (Gallemore and Labro 2015). This resulted in an increase in the quality of internal controls (Ashbaugh-Skaife, Collins, Kinney, and LaFond 2008). To test whether the increase in IIQ affects EIQ differently depending on the level of tax planning, I employ a differences-in-differences design using a sub-sample period that covers the fiscal years from 2002 to 2003 (pre-SOX period) and 2004 2006 (post-SOX period). *SOX* is an indicator variable equal to zero for the pre-SOX period and equal to one for the post-SOX period. To compare the impact of SOX on firms with different tax planning levels, I define *High TA_GAAP* is an indicator variable equal to one if the firm's industry- and size adjusted tax planning (*TA_GAAP*) is in the fifth percentile in the three years prior to SOX (1999 to 2001) and equal to zero if the observation is in the first quintile. To alleviate concerns about the imbalance of covariates, I entropy balance my sample on all control variables as well as the respective quintile of IIQ to account for differences in their distribution (see section 4.3). Then I regress EIQ measures on *High TA_GAAP*, *SOX* and the interaction of these two variables. The coefficient on *High TA_GAAP* is negative but only significant (at the 10% level) in one out of the three specifications, providing support for the parallel trend assumption when comparing firms with high vs. low tax planning in the pre-SOX period. Importantly, the interaction of *High TA_GAAP* and *SOX* is negative and significant at the 5% and 10% level for the two of the three EIQ proxy specifications. This result indicates that the impact of SOX on the level of external information quality was more negative for firms with high tax planning compared to low tax planning firms, providing support for Hypothesis 2 that tax planning moderates the association between IIQ and EIQ.

4.4.3 Structural Equation Modeling

Third, I perform exploratory analyses using structural equation modeling (SEM) to investigate how IIQ affects EIQ while allowing my proxies for IIQ to covary with each other (using a factor analysis). This system of equations allows me to connect the results of one regression using IIQ as a dependent variable and another regression in which EIQ is the dependent variable. Specifically, I constrain the paths within my analyses to determine if adding certain paths to the analyses improves the model fit. Then I compare different paths and model fit across various specifications. I run these analyses including all control variables from Table 4 as well as industry and year fixed effects (omitted for brevity). I also bifurcate my sample into *High TA* = 1 firms (Figure 3) and *Low TA* = 1 (Figure 4). The results provide further evidence for the positive association between IIQ and EIQ and the moderating effect of tax planning.

< Insert Figure 2 here >

< Insert Figure 3 here >

< Insert Figure 4 here >

5. Conclusion

This paper investigates whether internal information quality is associated with external information environment and whether tax planning attenuates this association. Using OLS and changes models, I hypothesize and find a positive association between IIQ and EIQ. However, further tests indicate that this association is moderated for firms with a high level of tax planning. Robustness tests that investigate the role of proprietary costs of disclosure and a structural equation model corroborate my findings. Taken together, my results imply that IIQ increases on average EIQ but that tax planning attenuates this association.

My findings add to the literature that investigates the relation between internal and external information environment (Hemmer and Labro 2008; Feng, Li, and McVay 2009; Chen et al. 2018b). I believe I am one of the first to directly examine the association between internal and external information quality. My results imply that increased IIQ generates spillovers to EIQ because managers convey higher quality internal information to market participants and stakeholders. This result indicates that policy measures that affect the internal information environment simultaneously affect the quality of information conveyed to external stakeholders. However, proprietary costs resulting from a high level of tax planning appear to moderate this effect.

Second, I also add to the literature that explores the relation between tax planning and the information environment (Chen et al. 2018a; Gallemore and Labro 2015; Laplante et al. 2017; McGuire et al. 2017). Specifically, my findings shed light on whether managers are unable or unwilling to convey to market participants important information about tax planning (Balakrishnan et al. 2018). While my results indicate that managers of firms with high IIQ on average convey more information and increase EIQ, my results also indicate that the level of tax planning moderates the disclosed information. This suggests that managers with high levels of tax planning are unwilling to disclose information.

Finally, my study responds to the call from Wilde and Wilson (2018) to examine costs and benefits of tax planning holistically. I provide evidence that market participants face costs through increased tax planning if internal planning capabilities are high. My findings provide evidence that tax planning is an indirect cost that shape managers' decisions to disclose information to market participants and result in costs for investors. This adds to literature on the direct and indirect costs of tax planning and its outcomes (Scholes and Wolfson 1992; Hanlon and Heitzman 2010; Robinson and Schmidt 2013; Inger et al. 2017; Wilde and Wilson 2018). Therefore, I believe that my results are of interest to academic literature and policy makers to assess the costs and benefits of additional tax disclosure requirements that aim to limit corporate tax planning.

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Appendix A – Variable Definitions

Variable	Definition
Measures for Information Quality	
External Information Quality	
EIQ_Disp	Average Dispersion of Analysts' Forecasts – measured as the three-year average of the standard deviation of analysts' annual earnings forecasts over the three years in which tax aggressiveness measures are calculated. Each year, the dispersion in forecasts immediately before the end of the fiscal year is scaled by the price at the end of the previous year (Balakrishnan et al. 2018). For ease of interpretation, I multiply the values by (-1).
EIQ_Error	Absolute Analysts' Forecast Errors – measured as the average absolute analysts' forecast errors over the three years in which tax aggressiveness measures are calculated. Each year, the forecast errors are the absolute value of the difference between mean analyst estimate reported immediately before the end of the fiscal year and the actual earnings for that fiscal year scaled by the price at the end of previous year. (Balakrishnan et al. 2018). For ease of interpretation, I multiply the values by (-1).
EIQ_BAS	Three-year average of monthly bid-ask spread (data derived from CRSP) calculated immediately before the end of the fiscal year. For ease of interpretation, I multiply the values by (-1).
Internal Information Quality	
IIQ_EAS (Earnings Announcement Speed)	The number of days between the end of the fiscal year and the firm's earnings announcement for year *t*, divided by 365. I then multiple this figure by negative one so that EAS is increasing with announcement speed (Gallemore and Labro 2015).
IIQ_EAS_R	Composite IIQ Variable that is measured by ranking *EAS* into deciles by industry (Fama-French 17) and year, each rank is multiplied by .1 so that the rank of EAS ranges from 0.1 to 1.0 and all firm years receive a value of zero if they have an error related restatement while firms without an error restatement retain their *EAS* decile ranking (McGuire et al. 2017).
IIQ_MFA (Management Forecast Accuracy)	Absolute value of (management's last available estimate of EPS before year-end minus actual EPS) multiplied by (-1), divided by year-end price (Gallemore and Labro 2015).
IIQ_No_ICW	Indicator variable equal to zero if the firm reported a Section 404 material weakness in the current fiscal year; one otherwise.

Tax Planning Measures

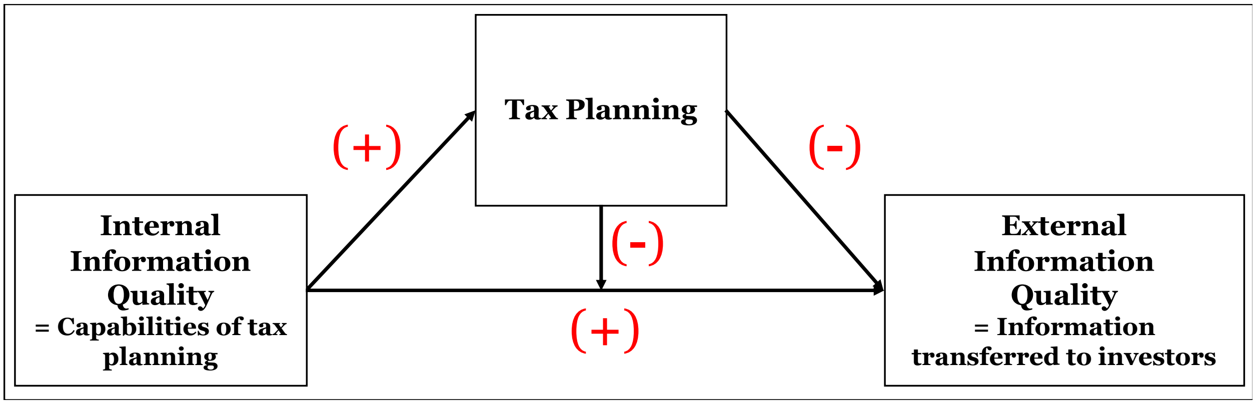
CASH ETR	Cash effective tax rate, calculated as cash taxes paid divided by total pre-tax income less special items ($TXPD_t/(PI_t\text{-}SPI_t)$) .
GAAP ETR	Book effective tax rate, calculated as total tax expense divided by total pre-tax income less special item (($TXT_t/(PI_t\text{-}SPI_t)$)).
High TA	Indicator variable with the value of one if a firm-year observations is in the fifth quintile of *TA_GAAP* (*TA_CASH*), and zero otherwise.
Low TA	Indicator variable with the value of one if a firm-year observations is in the first quintile of *TA_GAAP* (*TA_CASH*), and zero otherwise.
TA_CASH	Industry- and size-adjusted GAAP ETR (following Balakrishnan et al. 2018), measured as the mean GAAP ETR of the same industry-size portfolio firms less the firm *i*'s GAAP ETR, where GAAP ETR is the sum of total tax expense (TXT) over years *t* to *t– 2* divided by the sum of pretax income (PI) over years *t* to *t–2*. Higher values indicate greater amounts of relative tax avoidance.
TA_GAAP	Industry- and size-adjusted GAAP ETR (following Balakrishnan et al. 2018), measured as the mean GAAP ETR of the same industry-size portfolio firms less the firm *i*'s GAAP ETR, where GAAP ETR is the sum of total tax expense (TXT) over years *t* to *t– 2* divided by the sum of pretax income (PI) over years *t* to *t–2*. Higher values indicate greater amounts of relative tax avoidance.

Control Variables

Age	Natural log of the difference between the first year when the firm appears in Compustat and the current year *t*.
Analyst Following	Natural log of one plus the number of analyst estimates reported immediately before the end of the fiscal year.
BTD	Absolute value of average book-tax differences, measured over years *t–2* to *t*. Book-tax differences are defined as pretax income less taxable income: (PI_t - ($TXFED_t$ + $TXFO_t$) / STR_t)/$AT_{i,t-1}$, where STR_t is the top U.S. federal statutory tax rate faced by corporations in year *t*.
Foreign Income	Pre-tax foreign income, divided by average total assets.
Geographic Complexity	Revenue-based Hirfindahl-Hirschman index, calculated as the sum of the squares of each geographic segment's sales as a percentage of the total firm sales in year *t* (Bushman et al. 2004).
Institutional Ownership	Percentage of shares held by institutional owners at the end of the year. Data is obtained from the Thomson Reuters Institutional (13f) Holdings Database.
I_ROA	Industry- and size-adjusted return on returns on assets (calculated as operating income before depreciation divided by average total assets) to measure of abnormal segment profits (Berger and Hann 2007). *I_ROA* is

	measured at the firm level, the industry adjustment is based on the firm's primary Fama French 48 classification, the size adjustment based on the quintile of the firm within the industry.
Leverage	Average long-term debt, scaled by average total assets.
Loss	Indicator variable set to 1 if the firm has positive tax-loss carryforwards (TLCF), and 0 otherwise.
MTB	Market to book ratio at the beginning of the year, measured as market value of equity scaled by book value of equity.
Std Dev. of Sales	Standard deviation of annual sales (SALE) over the previous three years.
Size	Natural log of average total assets (log(Average(AT))). The average is calculated over years *t-1* and *t*.

Figure 1: Relationship between information environment dimensions and tax avoidance



Note: This figure presents the theoretical construct and the predicted relations between the respective constructs.

Figure 2: SEM – All Firms

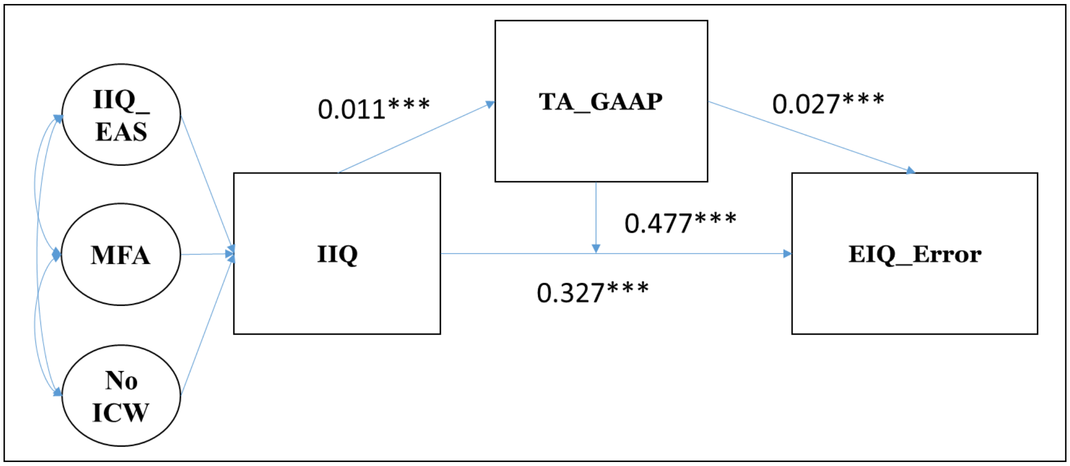


Figure 3: SEM - Firms with high level of tax planning

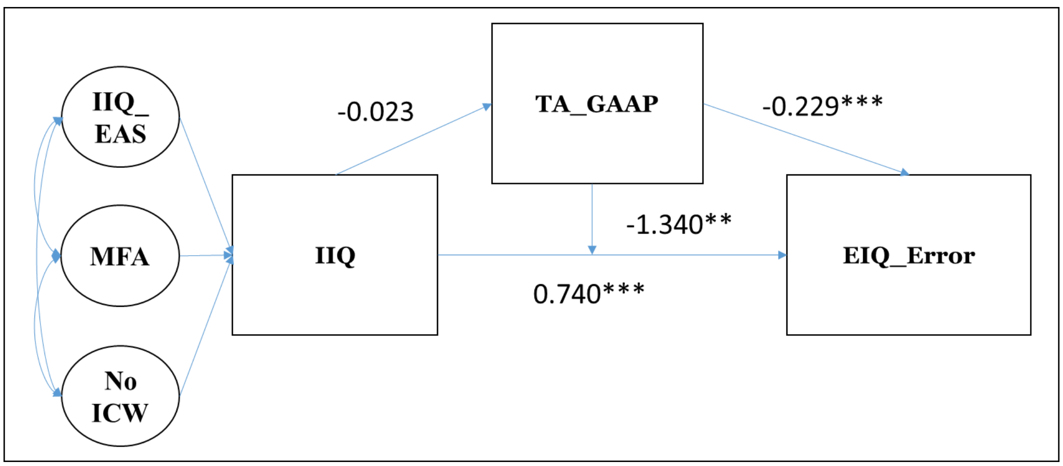


Figure 4: SEM - Firms with low level of tax planning

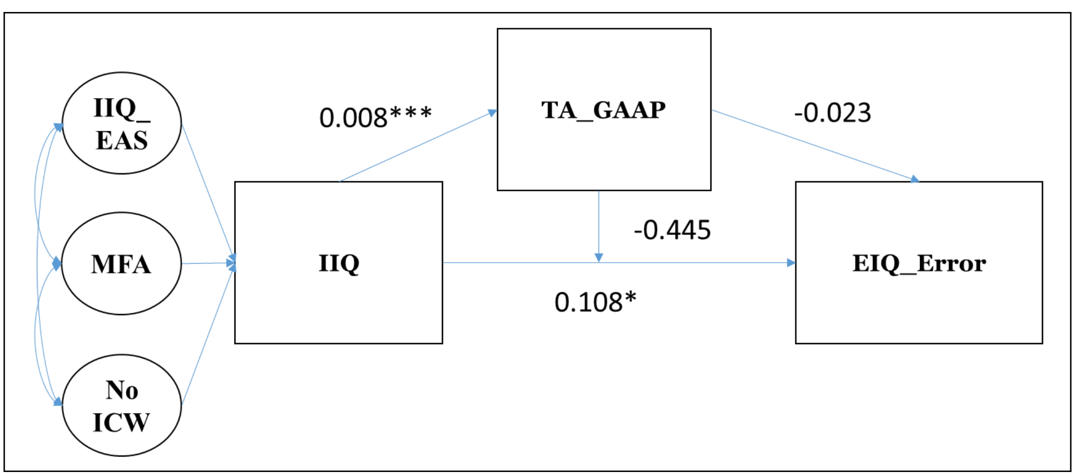


Table 1
Sample Selection

Data Restrictions	Firm Years
Total Compustat firm-year observations for fiscal years 1993 - 2016	187,608
Less: Financial firms (SIC 6000-6999)	31,593
Less: Observations with negative total assets and pretax income to compute TA measures	70,672
Less: Observations with insufficient data to compute *IIQ_EAS*	6,684
Less: Observations with insufficient data to compute *EIQ_Error*	25,104
Less: Observations with insufficient data to compute control variables	19,197
Full Sample: Firms with data to compute *EIQ_Error*	**34,358**
Less: Observations with insufficient data to compute *EIQ_Disp*	4,820
Subsample: Firms with data to compute *EIQ_Disp*	**29,538**

Note: This table presents the sample selection. The full sample (subsample) includes firm-year observations with available data to compute *EIQ_Error* (*EIQ_Disp*). I define variables in Appendix A.

Table 2
Descriptive Statistics

Variables	(1) N	(2) Mean	(3) SD	(4) P25	(5) Median	(6) P75	(7) Mean High TA_GAAP	(8) Mean Low TA GAAP	(9) Diff. (7) - (8)
EIQ_Error	34,358	-0.090	0.113	-0.106	-0.054	-0.027	-0.113	-0.073	***
EIQ_Disp	29,538	-0.339	0.482	-0.383	-0.185	-0.089	-0.420	-0.261	***
EIQ_BAS	25,583	-0.008	0.012	-0.011	-0.002	-0.001	-0.006	-0.014	***
IIQ_EAS	34,358	-0.086	0.026	-0.103	-0.083	-0.066	-0.093	-0.087	***
IIQ_EAS_R	34,358	0.650	0.273	0.500	0.700	0.900	0.584	0.649	***
IIQ_MFA	7,373	-0.005	0.011	-0.003	-0.001	-0.000	-0.006	-0.006	
IIQ_No_ICW	18,296	0.959	0.198	1.000	1.000	1.000	0.950	0.945	
GAAP ETR	34,358	0.313	0.160	0.256	0.345	0.384	0.082	0.474	***
CASH_ETR	34,358	0.256	0.184	0.128	0.258	0.348	0.127	0.349	***
TA_GAAP	34,358	-0.041	0.158	-0.112	-0.052	0.026	0.182	-0.243	***
TA_CASH	34,358	-0.017	0.178	-0.101	-0.010	0.105	0.106	-0.141	***
Size	34,358	6.719	1.778	5.413	6.590	7.889	6.870	5.769	***
Leverage	34,358	0.225	0.200	0.033	0.203	0.353	0.237	0.198	***
Loss	34,358	0.392	0.488	0.000	0.000	1.000	0.553	0.336	***
Foreign Income	34,358	0.019	0.035	0.000	0.000	0.024	0.025	0.011	***
MTB	34,358	3.135	3.093	1.524	2.308	3.689	3.083	3.193	*
Age	34,358	2.782	0.819	2.197	2.773	3.466	2.709	2.466	**
Analyst Following	34,358	1.314	0.920	0.693	1.386	1.946	1.386	1.081	***
Geo. Complexity	34,358	0.726	0.291	0.459	0.824	1.000	0.640	0.788	***
Std Dev. of Sales	34,358	0.405	0.954	0.030	0.089	0.299	0.447	0.220	***
BTD	34,358	0.051	0.058	0.015	0.032	0.062	0.073	0.049	***
Inst. Owner	34,358	0.588	0.268	0.401	0.634	0.793	0.553	0.536	***
I_ROA	34,358	0.059	0.107	-0.010	0.033	0.098	0.029	0.111	***

Note: This table presents descriptive statistics for the full sample. Columns 1-6 present descriptive statistics for all firms in the sample. *EIQ_Error*, *EIQ_Disp*, and *EIQ_BAS* are winsorized at 99th percentiles. All other continuous variables are winsorized at the 1st and 99th percentiles. Variables are defined in Appendix A. Statistical significance (two-sided) at the 10%, 5% and 1% level is denoted by *, **, and ***, respectively.

Table 3
Correlation Table

	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	EIQ_Error	1											
(2)	EIQ_Disp	**0.911**	1										
(3)	EIQ_BAS	**-0.154**	**-0.200**	1									
(4)	IIQ_EAS	**0.122**	**0.062**	**-0.042**	1								
(5)	IIQ_EAS_R	**0.122**	**0.074**	**-0.115**	**0.831**	1							
(6)	IIQ_MFA	**0.285**	**0.248**	**0.181**	**0.095**	**0.054**	1						
(7)	IIQ_No_ICW	0.004	-0.023	**0.070**	**0.201**	**0.142**	**0.079**	1					
(8)	GAAP_ETR	**0.068**	**0.066**	**-0.041**	**0.024**	**0.027**	**-0.039**	**-0.036**	1				
(9)	CASH_ETR	0.005	0.015	**-0.036**	**0.016**	**0.020**	**-0.089**	**-0.043**	**0.510**	1			
(10)	TA_GAAP	**-0.101**	**-0.096**	**0.178**	**-0.054**	**-0.060**	-0.003	0.006	**-0.389**	**-0.205**	1		
(11)	TA_CASH	**-0.056**	**-0.054**	**0.140**	**-0.035**	**-0.044**	0.022	**0.029**	**-0.242**	**-0.468**	**0.511**	1	
(12)	Size	**-0.192**	**-0.277**	**0.550**	**0.184**	**0.120**	**0.132**	**0.107**	-0.008	**-0.020**	**0.179**	**0.109**	1
(13)	Leverage	**-0.099**	**-0.088**	**0.023**	**-0.073**	**-0.054**	**-0.042**	**0.023**	0.005	**-0.032**	**0.062**	**0.089**	**0.308**
(14)	Loss	**-0.085**	**-0.098**	**0.229**	**-0.100**	**-0.112**	0.004	-0.001	**-0.055**	**-0.065**	**0.122**	**0.116**	**0.142**
(15)	Foreign Income	**-0.042**	**-0.085**	**0.183**	**0.076**	**0.051**	**0.069**	**0.022**	**-0.121**	**-0.029**	**0.106**	**0.045**	**0.199**
(16)	MTB	**0.100**	**0.072**	**0.114**	**0.123**	**0.104**	**0.145**	**0.013**	**-0.024**	**-0.036**	0.000	**0.031**	**0.032**
(17)	Age	**-0.088**	**-0.112**	**0.329**	**0.159**	**0.093**	**0.109**	**0.078**	0.004	**0.020**	**0.081**	**0.017**	**0.486**
(18)	Analyst Follow.	**-0.034**	**-0.184**	**0.457**	**0.208**	**0.135**	**0.159**	**0.078**	**-0.030**	**-0.038**	**0.102**	**0.090**	**0.504**
(19)	Geo. Complexity	**0.058**	**0.081**	**-0.241**	**-0.066**	**-0.037**	**-0.038**	0.003	**0.094**	**-0.030**	**-0.131**	**-0.033**	**-0.246**
(20)	Std Dev. of Sales	**-0.170**	**-0.254**	**0.208**	**0.117**	**0.086**	0.027	**0.051**	**-0.018**	**0.018**	**0.075**	**0.024**	**0.596**
(21)	BTD	**-0.057**	**-0.055**	0.005	**-0.071**	**-0.046**	**0.031**	-0.010	**-0.232**	**-0.264**	**0.119**	**0.182**	**-0.105**
(22)	Institutional Own.	**-0.042**	**-0.093**	**0.424**	**0.161**	**0.074**	**0.107**	**0.056**	**0.068**	0.002	**0.014**	**0.053**	**0.275**
(23)	I_ROA	**0.094**	**0.068**	**-0.225**	**0.081**	**0.091**	**0.051**	**0.024**	-0.005	**-0.017**	**-0.202**	**-0.112**	**-0.381**

Correlation Table (continued)

	Variables	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(13)	Leverage	1										
(14)	Loss	**0.023**	1									
(15)	Foreign Income	**-0.094**	**0.155**	1								
(16)	MTB	**-0.046**	**0.017**	**0.153**	1							
(17)	Age	**0.059**	**0.065**	**0.136**	**-0.045**	1						
(18)	Analyst Follow.	0.000	**0.165**	**0.217**	**0.204**	**0.131**	1					
(19)	Geo. Complexity	**0.111**	**-0.263**	**-0.521**	**-0.078**	**-0.158**	**-0.214**	1				
(20)	Std Dev. of Sales	**0.069**	**0.050**	**0.124**	**0.035**	**0.251**	**0.290**	**-0.137**	1			
(21)	BTD	**-0.086**	**0.010**	**0.102**	**0.167**	**-0.146**	0.011	-0.005	**-0.029**	1		
(22)	Institutional Own.	-0.010	**0.139**	**0.148**	**0.070**	**0.223**	**0.391**	**-0.156**	**0.040**	**-0.097**	1	
(23)	I_ROA	**-0.212**	**-0.141**	**0.062**	**0.307**	**-0.219**	**-0.071**	**0.106**	**-0.126**	**0.328**	**-0.116**	1

Note: This table presents Pearson correlation coefficients for the full sample. *EIQ_Error*, *EIQ_Disp*, and *EIQ_BAS* are winsorized at the 99th percentiles. All other continuous variables are winsorized at the 1st and 99th percentiles. Variables are defined in Appendix A. Bold coefficients denote significance at the 1% levels. Variables are defined in Appendix A.

Table 4
Association of internal and external information environment (H1)
Panel A: OLS specification

Variables	Predicted Sign	(1) *EIQ_Error*	(2) *EIQ_Error*	(3) *EIQ_Error*	(4) *EIQ_Error*	(5) *EIQ_Disp*	(6) *EIQ_Disp*	(7) *EIQ_Disp*	(8) *EIQ_Disp*	(9) *EIQ_BAS*	(10) *EIQ_BAS*	(11) *EIQ_BAS*	(12) *EIQ_BAS*
IIQ_EAS	+	0.291***				0.801**				0.091***			
		(0.065)				(0.321)				(0.012)			
IIQ_EAS_R	+		0.023***				0.064**				0.006***		
			(0.005)				(0.024)				(0.001)		
IIQ_MFA	+			2.317***				9.761***				0.028**	
				(0.293)				(1.331)				(0.013)	
IIQ_No_ICW	+				0.019**				0.061**				0.000
					(0.007)				(0.028)				(0.000)
Size	-	-0.008***	-0.008***	-0.005**	-0.012***	-0.036***	-0.035***	-0.030***	-0.049***	0.003***	0.003***	0.001***	0.001***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.007)	(0.007)	(0.009)	(0.008)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	-	-0.026***	-0.027***	-0.019	-0.027**	-0.078***	-0.081***	-0.020	-0.071*	-0.006***	-0.006***	-0.004***	-0.002***
		(0.006)	(0.006)	(0.014)	(0.010)	(0.026)	(0.026)	(0.059)	(0.039)	(0.001)	(0.001)	(0.001)	(0.000)
Loss	-	-0.000	-0.000	0.004	0.002	-0.008	-0.008	0.020	-0.003	-0.001***	-0.001***	-0.000	-0.000
		(0.002)	(0.002)	(0.004)	(0.003)	(0.010)	(0.010)	(0.015)	(0.015)	(0.000)	(0.000)	(0.000)	(0.000)
Foreign Income	-	-0.014	-0.015	0.005	-0.004	-0.267	-0.269	-0.090	-0.228	-0.005*	-0.005*	-0.002	-0.000
		(0.040)	(0.041)	(0.054)	(0.056)	(0.201)	(0.202)	(0.233)	(0.273)	(0.002)	(0.002)	(0.002)	(0.001)
MTB	?	0.003***	0.003***	0.001	0.003***	0.012***	0.012***	0.002	0.011***	0.000***	0.000***	0.000**	0.000***
		(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
Age	+	0.004*	0.004**	0.000	0.008**	0.017**	0.019**	0.007	0.027*	0.000	0.000	0.000	-0.000**
		(0.002)	(0.002)	(0.003)	(0.003)	(0.008)	(0.007)	(0.012)	(0.012)	(0.000)	(0.000)	(0.000)	(0.000)
Analyst Follow.	+	0.012***	0.013***	0.007***	0.021***	-0.017**	-0.016**	-0.019*	-0.012	0.001***	0.001***	0.001***	0.000***
		(0.002)	(0.002)	(0.002)	(0.003)	(0.007)	(0.007)	(0.010)	(0.010)	(0.000)	(0.000)	(0.000)	(0.000)
Geo. Complexity	-	-0.006	-0.006	-0.010	-0.006	-0.030	-0.030	-0.046	-0.038	-0.001	-0.001	-0.000	0.000
		(0.006)	(0.006)	(0.007)	(0.009)	(0.026)	(0.026)	(0.030)	(0.036)	(0.000)	(0.000)	(0.000)	(0.000)
Std Dev. Sales	-	-0.009***	-0.009***	-0.003	-0.010***	-0.056***	-0.056***	-0.017	-0.063***	-0.002***	-0.002***	-0.001***	-0.001***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.013)	(0.013)	(0.015)	(0.014)	(0.000)	(0.000)	(0.000)	(0.000)
BTD	-	-0.115***	-0.118***	-0.053**	-0.122***	-0.315***	-0.323***	-0.170	-0.381**	0.004**	0.004**	-0.001	-0.000
		(0.019)	(0.019)	(0.024)	(0.033)	(0.092)	(0.093)	(0.113)	(0.150)	(0.002)	(0.002)	(0.002)	(0.001)
Inst. Owner.	+	-0.014*	-0.013*	-0.023***	-0.033***	-0.093***	-0.088***	-0.096***	-0.160***	0.007***	0.007***	0.005***	0.004***
		(0.007)	(0.007)	(0.007)	(0.008)	(0.030)	(0.028)	(0.031)	(0.035)	(0.001)	(0.001)	(0.001)	(0.001)
I_ROA	?	0.012	0.014	0.015	-0.009	-0.127*	-0.119*	-0.024	-0.192*	-0.002	-0.002	-0.001	0.000
		(0.016)	(0.015)	(0.022)	(0.021)	(0.068)	(0.068)	(0.095)	(0.097)	(0.001)	(0.001)	(0.001)	(0.001)
Observations		34,358	34,358	7,373	18,296	29,538	29,538	6,662	17,283	25,583	25,583	6,030	16,637
Adj. R-squared		0.186	0.186	0.255	0.172	0.259	0.259	0.271	0.249	0.715	0.715	0.668	0.381
Firm & Year Cluster		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind. & Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Changes Model

Variables	Pred. Sign	(1) *EIQ_Error*	(2) *EIQ_Error*	(3) *EIQ_Error*	(4) *EIQ_Error*	(5) *EIQ_Disp*	(6) *EIQ_Disp*	(7) *EIQ_Disp*	(8) *EIQ_Disp*	(9) *EIQ_BAS*	(10) *EIQ_BAS*	(11) *EIQ_BAS*	(12) *EIQ_BAS*
Δ *IIQ_EAS*	+	0.197***				0.498**				0.004*			
		(0.049)				(0.228)				(0.002)			
Δ *IIQ_EAS_R*	+		0.006**				0.013				0.000		
			(0.002)				(0.014)				(0.000)		
Δ *IIQ_MFA*	+			1.511***				5.772***				-0.007**	
				(0.211)				(0.761)				(0.003)	
Δ *IIQ_No_ICW*	+				0.008*				0.023*				0.000
					(0.004)				(0.012)				(0.000)
Δ Size	-	-0.031***	-0.030***	-0.022**	-0.046***	-0.142***	-0.142***	-0.081*	-0.205***	0.003***	0.003***	0.001***	0.001***
		(0.006)	(0.006)	(0.009)	(0.012)	(0.023)	(0.023)	(0.046)	(0.043)	(0.001)	(0.001)	(0.000)	(0.000)
Δ Leverage	-	-0.029***	-0.030***	-0.016	-0.042***	-0.145***	-0.147***	-0.057	-0.181***	-0.001***	-0.001***	-0.000	-0.001***
		(0.006)	(0.006)	(0.012)	(0.008)	(0.026)	(0.026)	(0.051)	(0.028)	(0.000)	(0.000)	(0.001)	(0.000)
Δ Loss	-	-0.000	-0.000	0.006*	-0.002	0.001	0.001	0.031**	-0.005	-0.000	-0.000	-0.000*	-0.000*
		(0.002)	(0.002)	(0.003)	(0.004)	(0.011)	(0.011)	(0.015)	(0.017)	(0.000)	(0.000)	(0.000)	(0.000)
Δ Foreign Income	-	-0.039	-0.039	-0.125	-0.048	0.065	0.067	-0.540	0.115	-0.001	-0.001	0.001	0.000
		(0.069)	(0.068)	(0.091)	(0.105)	(0.263)	(0.263)	(0.457)	(0.366)	(0.001)	(0.001)	(0.002)	(0.001)
Δ MTB	?	0.000	0.000	-0.000	-0.000	0.003**	0.003**	-0.002	0.001	0.000*	0.000**	-0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Δ Age	+	-0.007	-0.005	-0.004	0.007	0.023	0.030	-0.013	0.051	0.006***	0.006***	0.003**	0.002***
		(0.006)	(0.007)	(0.022)	(0.020)	(0.037)	(0.039)	(0.069)	(0.097)	(0.002)	(0.002)	(0.001)	(0.001)
Δ Analyst Follow.	+	0.000	0.001	0.003*	0.001	-0.008*	-0.007*	0.003	-0.007	0.000***	0.000***	0.000**	0.000**
		(0.001)	(0.001)	(0.001)	(0.002)	(0.004)	(0.004)	(0.007)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)
Δ Geo. Complex.	-	-0.005	-0.005	-0.000	-0.010	-0.047**	-0.047**	-0.045	-0.072**	0.000	0.000	-0.000	0.000
		(0.005)	(0.005)	(0.008)	(0.010)	(0.018)	(0.018)	(0.031)	(0.024)	(0.000)	(0.000)	(0.000)	(0.000)
Δ SD Sales	-	-0.001	-0.001	0.001	-0.001	-0.011*	-0.011*	-0.005	-0.016*	-0.000***	-0.000***	-0.000	-0.000*
		(0.001)	(0.001)	(0.003)	(0.002)	(0.007)	(0.007)	(0.017)	(0.009)	(0.000)	(0.000)	(0.000)	(0.000)
Δ BTD	-	-0.066***	-0.066***	-0.005	-0.041	-0.240**	-0.238**	0.039	-0.219	-0.001	-0.001	0.000	-0.001
		(0.023)	(0.023)	(0.028)	(0.034)	(0.088)	(0.088)	(0.127)	(0.141)	(0.001)	(0.001)	(0.001)	(0.000)
Δ Instit. Owner.	+	0.008*	0.009**	0.004	-0.002	0.051***	0.053***	0.055	0.008	0.001***	0.001***	0.002*	0.001*
		(0.004)	(0.004)	(0.009)	(0.007)	(0.016)	(0.015)	(0.038)	(0.029)	(0.000)	(0.000)	(0.001)	(0.000)
Δ I_ROA	?	0.004	0.007	0.045	-0.048	-0.085	-0.079	0.353*	-0.231	-0.000	-0.000	0.001	-0.001
		(0.024)	(0.024)	(0.038)	(0.047)	(0.101)	(0.103)	(0.175)	(0.176)	(0.001)	(0.001)	(0.002)	(0.001)
Observations		25,098	25,098	4,835	13,344	19,962	19,962	4,288	12,091	18,200	18,200	4,007	12,225
Adj. R-squared		0.072	0.072	0.178	0.087	0.087	0.086	0.161	0.093	0.217	0.217	0.335	0.181
Industry Cluster		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind. & Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents regression results for the tests that examine the association between IIQ and EIQ. Panel A, Columns 1 to 4 (5 to 8) [9 to 12] report coefficients for an OLS regressions based on Equation (1) for *EIQ_Error* (*EIQ_Disp*) [*EIQ_BAS*]. Panel B, Columns 1 to 4 (5 to 8) [9 to 12] report coefficients for changes model regressions based on Equation (1) for *EIQ_Error* (*EIQ_Disp*) [*EIQ_BAS*]. *EIQ_Error* is the average absolute analysts' forecast errors over three years, multiplied by (-1). *EIQ_Disp* is the three-year average of the standard deviation of analysts' annual earnings forecasts over the three years, multiplied by (-1). *EIQ_BAS* is the three-year average of the monthly bead-ask spread calculated immediately before the end of the fiscal year, multiplied by (-1). *IIQ_EAS* is the earnings announcement speed in days scaled by 365 and multiplied by (-1). *EIQ_Error*, *EIQ_Disp*, and *EIQ_BAS* are winsorized at the 99th percentiles. All other continuous variables are winsorized at the 1st and 99th percentiles. All regressions are estimated with year and industry-fixed effects. I report heteroscedasticity-robust standard errors clustered by firm and year in parentheses. I define variables in Appendix A. Statistical significance (two-sided) at the 10%, 5% and 1% level is denoted by *, **, and ***, respectively.

Table 5
Effect of Tax Planning on Information Environment (H2)
Panel A: OLS Regression using *TA_GAAP*

	Predicted Sign	All (1)	All (2)	All (3)	All (4)	High TA = 1 (5)	Low TA = 1 (6)
Variables		*EIQ_Error*	*EIQ_Error*	*EIQ_Error*	*EIQ_Error*	*EIQ_Error*	*EIQ_Error*
TA_GAAP	-	-0.023***		-0.024***	0.000	-0.262**	0.046**
		(0.006)		(0.006)	(0.020)	(0.100)	(0.019)
IIQ_EAS	+		0.291***	0.294***	0.302***	0.871***	0.245***
			(0.065)	(0.065)	(0.065)	(0.271)	(0.070)
TA_GAAP* IIQ_EAS	**+/-**				**0.265**	**-1.882***	**0.320**
					(0.199)	**(0.991)**	**(0.203)**
Size	-	-0.007***	-0.008***	-0.008***	-0.008***	-0.013***	-0.006***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Leverage	-	-0.030***	-0.026***	-0.025***	-0.026***	-0.042***	-0.019***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.012)	(0.006)
Loss	-	-0.000	-0.000	-0.000	-0.000	-0.002	0.002
		(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.003)
Foreign Income	-	-0.013	-0.014	-0.009	-0.011	-0.124	0.006
		(0.040)	(0.040)	(0.040)	(0.040)	(0.091)	(0.054)
MTB	?	0.003***	0.003***	0.003***	0.003***	0.002**	0.004***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Age	+	0.005**	0.004*	0.003*	0.003*	0.002	0.002
		(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
Analyst Follow.	+	0.014***	0.012***	0.012***	0.012***	0.016***	0.008***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Geo. Complexity	-	-0.006	-0.006	-0.007	-0.007	-0.007	-0.004
		(0.006)	(0.006)	(0.006)	(0.006)	(0.010)	(0.008)
Std Dev. Sales	-	-0.009***	-0.009***	-0.009***	-0.009***	-0.007	-0.010**
		(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
BTD	-	-0.108***	-0.115***	-0.103***	-0.103***	-0.133***	-0.076***
		(0.019)	(0.019)	(0.019)	(0.019)	(0.042)	(0.025)
Institutional Owner.	+	-0.012	-0.014*	-0.015**	-0.015**	-0.026**	-0.009
		(0.007)	(0.007)	(0.007)	(0.007)	(0.010)	(0.008)
I_ROA	?	0.014	0.012	0.005	0.005	-0.006	0.025
		(0.016)	(0.016)	(0.016)	(0.016)	(0.035)	(0.015)
*F-Test (IIQ_EAS + TA_GAAP*IIQ_EAS = 0*					[0.567]**	[-1.011]	[0.565]**
Prob > F =					0.020	0.197	0.028
Observations		34,358	34,358	34,358	34,358	6,696	6,471
Adj. R-squared		0.185	0.186	0.187	0.188	0.123	0.211
Firm & Year Cluster		Yes	Yes	Yes	Yes	Yes	Yes
Ind. & Year FE		Yes	Yes	Yes	Yes	Yes	Yes

Panel B: OLS Regression using *TA_CASH*

	Pred. Sign	All (1)	All (2)	All (3)	All (4)	High TA = 1 (5)	Low TA = 1 (6)
Variables		*EIQ_Error*	*EIQ_Error*	*EIQ_Error*	*EIQ_Error*	*EIQ_Error*	*EIQ_Error*
TA_CASH	-	-0.006		-0.007	0.006	-0.221	0.037
		(0.005)		(0.005)	(0.015)	(0.190)	(0.025)
IIQ_EAS	+		0.291***	0.293***	0.295***	0.581	0.249**
			(0.065)	(0.065)	(0.065)	(0.400)	(0.117)
TA_CASH* IIQ_EAS	**+/-**				**0.146**	**-1.115**	**0.272**
					(0.170)	**(1.949)**	**(0.292)**
Size	-	-0.007***	-0.008***	-0.008***	-0.008***	-0.013***	-0.006**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Leverage	-	-0.030***	-0.026***	-0.025***	-0.026***	-0.032***	-0.023***
		(0.006)	(0.006)	(0.006)	(0.006)	(0.011)	(0.008)
Loss	-	-0.000	-0.000	-0.000	-0.000	0.000	0.002
		(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.004)
Foreign Income	-	-0.017	-0.014	-0.013	-0.014	-0.079	-0.012
		(0.041)	(0.040)	(0.040)	(0.041)	(0.073)	(0.093)
MTB	?	0.003***	0.003***	0.003***	0.003***	0.002**	0.003***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Age	+	0.005**	0.004*	0.004*	0.004*	-0.002	0.000
		(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Analyst Follow.	+	0.014***	0.012***	0.012***	0.012***	0.022***	0.006***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Geo. Complexity	-	-0.006	-0.006	-0.006	-0.006	0.011	-0.008
		(0.006)	(0.006)	(0.006)	(0.006)	(0.011)	(0.010)
Std Dev. Sales	-	-0.009***	-0.009***	-0.009***	-0.009***	-0.009**	-0.013**
		(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.006)
BTD	-	-0.116***	-0.115***	-0.110***	-0.110***	-0.186***	-0.079*
		(0.019)	(0.019)	(0.019)	(0.019)	(0.049)	(0.041)
Inst. Owner.	+	-0.011	-0.014*	-0.014*	-0.014*	-0.011	-0.000
		(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)
I_ROA	?	0.019	0.012	0.010	0.010	0.007	0.040**
		(0.016)	(0.016)	(0.016)	(0.016)	(0.041)	(0.018)
*F-Test (IIQ_EAS + TA_CASH*IIQ_EAS = 0)*					[0.441]**	[-0.534]	[0.521]
Prob > F =					*0.028*	*0.735*	*0.189*
Observations		34,358	34,358	34,358	34,358	13,524	6,747
Adj. R-squared		0.184	0.186	0.187	0.187	0.244	0.160
Firm & Year Cluster		Yes	Yes	Yes	Yes	Yes	Yes
Ind. & Year FE		Yes	Yes	Yes	Yes	Yes	Yes

Panel C: Results from Entropy-Balancing

Variables	High TA_GAAP = 1		Low TA_GAAP = 1	
	Before	After	Before	After
IIQ_EAS	0.340	0.334	0.469	0.334
Size	6.677	6.677	5.733	6.677
Leverage	0.239	0.239	0.198	0.239
Loss	0.519	0.519	0.338	0.519
Foreign Income	0.022	0.022	0.011	0.022
MTB	3.036	3.036	3.313	3.036
Age	2.583	2.583	2.432	2.583
Analyst Following	1.257	1.257	1.037	1.257
Geo. Complexity	0.640	0.675	0.801	0.675
Std Dev. of Sales	0.447	0.401	0.177	0.401
BTD	0.073	0.080	0.050	0.080
Inst. Owner	0.553	0.491	0.509	0.491
I_ROA	0.029	0.032	0.113	0.032

Panel D: OLS Regression using Entropy-Balanced Sample

Variables	Predicted Sign	(1) *EIQ_Error*	(2) *EIQ_Disp*	(3) *EIQ_BAS*
High_Low_TA_GAAP	+	-0.032**	-0.129**	-0.005**
		(0.012)	(0.055)	(0.002)
IIQ_EAS	-	0.975***	3.607***	0.112***
		(0.157)	(0.685)	(0.017)
High_Low_TA_GAAP*IIQ_EAS	**+/-**	-0.309**	-1.098*	-0.042**
		(0.136)	(0.544)	(0.017)
Observations		5,612	4,633	3,629
Adj. R-squared		0.223	0.268	0.553
Firm & Year Cluster		Yes	Yes	Yes
Ind. FE		Yes	Yes	Yes

Note: This table presents regression results for the tests that examine the moderating effect of tax planning on the association between IIQ and EIQ. Panel A (B) presents results for OLS regressions based on Equation (3) using *TA_GAAP (TA_CASH)*. Panel C presents results of entropy balancing and Panel D the results for OLS regressions based on Equation (3) using the entropy-balanced sample. I entropy balance my sample on all control variables, the respective quintile of IIQ, and industry-year to account for differences in their distribution. In Panel A and B, Column 1 (2) presents results for a model that includes *TA_CASH* (*IIQ_EAS*) only. Columns 3 to 6 presents results for the fully specified model of Equation (3) and (4), respectively. Column 4 estimates the model for the full sample, Column 5 (6) for firm-year observations with *High TA* = 1 (*Low TA* = 1) for *TA_CASH*. Panel C presents the results for entropy balancing using all control variables as well as the respective quintile of IIQ to account for differences in their distribution. Panel D presents results for OLS regressions based on Equation (3). *High_Low_TA_GAAP* is an indicator variable equal to one if the firm's industry- and size adjusted tax planning (*TA_GAAP*) is in the fifth percentile and equal to zero if the observation is in the first quintile. *IIQ_EAS* is the earnings announcement speed in days scaled by 365 and multiplied by (-1). *EIQ_Error* is the average absolute analysts' forecast errors over three years, multiplied by (-1). *EIQ_Disp* is the average dispersion of analysts' forecasts over three years, multiplied by (-1). *EIQ_BAS* is the three-year average of monthly bid-ask spread calculated immediately before the end of the fiscal year, multiplied by (-1). All regressions are estimated with year and industry-fixed effects. I report heteroscedasticity-robust standard errors clustered by firm and year in parentheses. I define variables in the Appendix. Statistical significance (two-sided) at the 10%, 5% and 1% level is denoted by *, **, and ***, respectively.

Table 6
Robustness Test – Proprietary Costs

≈	Predicted Sign	*Low I_ROA (I_ROA < Median I_ROA)* (1)	*High I_ROA (I_ROA > Median I_ROA)* (2)
Variables		*EIQ_Error*	*EIQ_Error*
TA_GAAP	**-**	0.029	-0.064*
		(0.027)	(0.037)
IIQ_EAS	+	0.468***	0.055
		(0.083)	(0.091)
TA_GAAP* IIQ_EAS	**?**	**0.505***	**-0.287**
		(0.279)	**(0.358)**
Observations		13,659	13,613
Adj. R-squared		0.163	0.237
Controls		Yes	Yes
Firm & Year Cluster		Yes	Yes
Ind. & Year FE		Yes	Yes

Note: This table presents regression results for robustness tests that examine the moderating effect of proprietary costs on the association between IIQ and EIQ. Columns 1 and 2 report coefficients for an OLS regressions based on Equation (3) for firm-year observations with low proprietary costs (below the median of *I_ROA* (*Low I_ROA)*) and high proprietary costs (above the median of *I_ROA* (*High I_ROA)*), respectively. *I_ROA* is the industry-size adjusted return on returns on assets (calculated as operating income before depreciation divided by average total assets) to measure of abnormal segment profits. *EIQ_Error* is the average absolute analysts' forecast errors over three years, multiplied by (-1). *IIQ_EAS* is the earnings announcement speed in days scaled by 365 and multiplied by (-1). *EIQ_Error* is winsorized at the 99th percentile. All other continuous variables are winsorized at the 1st and 99th percentiles. All regressions are estimated with year and industry-fixed effects. I report heteroscedasticity-robust standard errors clustered by firm and year in parentheses. I define variables in the Appendix. Statistical significance (two-sided) at the 10%, 5% and 1% level is denoted by *, **, and ***, respectively.

Table 7
Tax Planning and the Sarbanes-Oxley Act (2002)

	Predicted Sign	(1)	(2)	(3)
Variables		*EIQ_Error*	*EIQ_Disp*	*EIQ_BAS*
High TA_GAAP	-	-0.007	-0.039*	0.000
		(0.005)	(0.016)	(0.001)
SOX	+/-	-0.013**	-0.071**	0.007**
		(0.004)	(0.023)	(0.002)
High TA_GAAP*SOX	-	-0.016**	-0.040*	0.000
		(0.004)	(0.016)	(0.001)
Observations		2,895	2,638	2,124
Adj. R-squared		0.132	0.144	0.181
Firm & Year Cluster		Yes	Yes	Yes
Ind. & Year FE		Yes	Yes	Yes

Note: This table presents regression results for the effect of the Sarbanes-Oxley Act (2002) on firms' external information quality. The sub-sample period covers the fiscal years from 2002 to 2003 (pre-SOX period) and 2004 to 2006 (post-SOX period). I entropy balance my sample on all control variables, the respective quintile of IIQ, and industry-year to account for differences in their distribution. Columns 1 to 3 report coefficients for an OLS regressions based on Equation (3) for *EIQ_Error*, *EIQ_Disp*, and *EIQ_BAS*, respectively. *High TA_GAAP* is an indicator variable equal to one if the firm's industry- and size adjusted tax planning (*TA_GAAP*) is in the fifth percentile in the three years prior to SOX (1999 to 2001) and equal to zero if the observation is in the first quintile. *SOX* is an indicator variable equal to zero for the pre-SOX period and equal to one for the post-SOX period. *EIQ_Error* is the average absolute analysts' forecast errors over three years, multiplied by (-1). *EIQ_Disp* is the three-year average of the standard deviation of analysts' annual earnings forecasts over the three years, multiplied by (-1). *EIQ_BAS* is the three-year average of the monthly bead-ask spread calculated immediately before the end of the fiscal year, multiplied by (-1). *EIQ_Error*, *EIQ_Disp*, and *EIQ_BAS* are winsorized at the 99th percentiles. All other continuous variables are winsorized at the 1st and 99th percentiles. All regressions are estimated with year and industry-fixed effects. I report heteroscedasticity-robust standard errors clustered by firm and year in parentheses. I define variables in Appendix A. Statistical significance (two-sided) at the 10%, 5% and 1% level is denoted by *, **, and ***, respectively.

Table A.1
Replication of prior research (Gallemore and Labro 2015 and Balakrishnan et al. 2018)

	Gallemore and Labro (2015)				**Balakrishnan et al. (2018)**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	*Cash ETR*	*Cash ETR*	*Cash ETR*	*Cash ETR*	*AF_Error*	*AF_Disp*	*Bid-Ask Spread*
IV = IIQ_EAS	-0.441***						
	(0.076)						
IV = IIQ_EAS_R		-0.030***					
		(0.006)					
IV = IIQ_MFA			-1.503***				
			(0.357)				
IV = IIQ_No ICW				-0.054***			
				(0.011)			
IV = TA_GAAP					0.023***	0.075***	0.001
					(0.006)	(0.019)	(0.001)
Observations	34,358	34,358	7,373	18,296	34,358	29,538	25,542
Adj. R-squared	0.054	0.125	0.143	0.149	0.184	0.259	0.226
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm & Year Cluster	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind. & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of the replication of the main tests of Gallemore and Labor (2015) and Balakrishnan et al. (2018). The dependent variables of the respective regression are depicted on the right hand side and the used proxies for *IIQ* and *EIQ* below the column numbers, respectively. Differences in the number of observations vary due to data requirements for control variables and availability of data.