

論 文

Tax Avoidance by Overconfident Managers and Restraint by Corporate Governance : Evidence from Japan

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1 Introduction

Overconfidence has been thought to be a common personal characteristic among CEOs and may have an effect on CEOs' investment decisions and financial reporting choices (Goel and Thakor, 2008). Therefore, overconfi-

dent managers tend to invest in higher risk ventures (Malmendier and Tate, 2008 ; Hirshleifer et al., 2012).

Upper echelons theory suggests that organizational behaviors reflect the personal qualities of top executives (Hambrick, 2016 ; Hambrick and Mason, 1984), and CEO overconfidence may play an important role in corporate policy setting and strategic decisions (Hribar and Yang, 2016). The voluminous literature on the subject has demonstrated that companies with overconfident CEOs are more likely to have more intense investments (Brown and Sarma, 2007 ; Malmendier and Tate, 2005, 2008), more innovative activities, and greater innovation success (Galasso and Simcoe, 2011 ; Hirshleifer et al., 2012) relative to companies with non-overconfident CEOs. Overconfident CEOs also require stronger cash inflows as compared to non-overconfident CEOs to satisfy their investment and innovation funding needs (Richardson, 2006).

Overconfidence also affects financial reporting decisions, as firms with overconfident managers are more likely to misstate earnings (Schrand and Zechman, 2012), use less conservative accounting (Ahmed and Duellman, 2013), and engage in more optimistic forecasting (Hribar and Yang, 2016). Corporate tax policy depends on a combination of investments (i.e., tax planning activities) and reporting decisions (i.e., tax accounting), making it a particularly important setting in which to examine the role of CEO overconfidence. In this context, this study examines the association between the attributes of overconfident managers and corporate behaviors for tax avoidance. In recent years, under the upper echelons theory, it has been debated that management characteristics, such as managerial abilities will affect the results of an organization (Hambrick and Mason, 1984). In this case, it is said that the characteristics of the manager or the board of directors, such as excessive confidence, will have a significant influence on various management decisions (Hambrick and Finkelstein, 1987 ; Ge, Matsumoto, and Zhang, 2011).

Companies with overconfident managers are also expected to pursue tax avoidance as severely as companies with overconfident management are overly optimistic about taxation, even in the case of tax decision-making.

Therefore, it is speculated that companies with overconfident management will drive the tax burden down by pursuing tax avoidance. In other words, some overconfident managers recognize tax avoidance as an important tool for achieving profit targets.

Chyz et al. (2019) expect that managerial overconfidence is positively related to corporate tax avoidance, and examine this in a primary sample of 1,090 to 1,220 firm-year observations from 135 publicly traded U.S. firms, all of which experienced an exogenous CEO departure sometime between 1993 and 2007. Their findings suggest that managerial overconfidence is associated with higher degrees of tax avoidance.

Hriber and Yang (2016) examine how overconfidence affects the properties of management forecasts. Using both the “over-optimism” and “miscalibration” dimensions of overconfidence, they examine three research questions. First, they wonder whether overconfidence increases the likelihood of issuing a forecast. Second, they investigate whether overconfidence increases the amount of optimism in management forecasts. Third, they attempt to analyze whether overconfidence increases the precision of the forecast. Using both options and press-based measures to proxy for individual overconfidence, they show supports for all three research questions.

The extant literature thus informs us that overconfident managers are inclined to undertake more risky projects than conventional managers. In addition, such managers are keen to instigate schemes for tax avoidance, thus, it is necessary to construct some sort of high-risk device. It is clear that overconfident managers tend to actively undertake risky investment projects. In order to carry out tax saving instruments, dealings that are somewhat risky are necessary. From this perspective, we propose three hypotheses to investigate these issues.

Our first hypothesis is that overconfident managers are more likely to tolerate risky management choices such as tax reduction activities and tax management schemes. Of relevance is not only the economic environment but also management’s own characteristics and preferences, and incentives for managers to direct management resources to tax aggressiveness.

For example, Rego and Wilson (2012) use six indicators of tax avoidance

to show a positive association between tax avoidance and CEO and CFO compensation levels. The determinant of the reward level here was risk acceptance. Overconfident managers tend to estimate the investment return from investing in tax avoidance higher than subsequent research risks (for example : Hirshleifer et al., 2012 ; Gallemore, Maydew, and Thornock, 2014 ; Rego and Wilson, 2012).

For the second hypothesis, we propose the proposition that firms are more likely to prepare countermeasures against a risk tolerant attitude overconfident managers hold. We expect firms to construct an internal control mechanism and external monitoring system to execute their corporate strategy and protect shareholders' interest, since overconfident managers are prone to undertake risky projects over a short horizon. Firms with effective monitoring functions are likely to restrain the overconfident managers from aggressive managerial behaviors. Thus, the extent of tax avoidance varies with the strength of external monitoring by managers.

Our third hypothesis is closely related with the second hypothesis and tells us that the degree of tax avoidance depends on the risk tolerance of firms. The risk tolerance of managers depends on the extent of their overconfidence which alters the amount of intended tax reduction. Thus, we propose a third hypothesis, that the extent of management overconfidence affects the amount of tax avoidance.

We adopt two measures of overconfidence, such as Firm4 and Firm5 from Schrand and Zechman (2012) and Malmendier and Tate (2005). We also adopt two long-term tax-avoidance measures, ETR5 and CETR5 (Dyreng et al., 2008), to test our research hypothesis.

For our primary analysis, we regress measures of tax avoidance on managerial overconfidence, control variables, firm fixed effects, and year fixed effects. This allows us to isolate the effect of overconfidence while holding constant the firm and controlling for covariates shown in the literature to be associated with tax avoidance. The coefficient estimates on the variable of interest in these regressions represents the mean within-firm effect on tax avoidance that is driven by plausibly exogenous changes in overconfidence. Our results indicate a statistically and economically significant positive rela-

tion between tax avoidance and managerial overconfidence. Moreover, we employ two alternative measures of overconfidence of management, such as Firm4 and Firm5, used elsewhere, with similar results. We also provide subjective evidence that suggests that firms with overconfident managers are more likely to adopt tax aggressive measures.

The contribution of our study to upper echelon related research involves manager effects on corporate choices about tax management (Bamber et al., 2010 ; Dyreng et al. 2010). Specifically, our study is original in that we use exogenous CEO changes to explain corporate tax strategy using Japanese data. Our study also contributes to the general literature on corporate tax avoidance. These studies suggest that individual executives' characteristics help determine firms' tax avoidance (Chyz, 2013 ; Olsen and Stekelberg, 2016). We extend this literature by relating overconfidence to corporate tax avoidance. For example, Hsieh et al. (2018) use inter-firm research that does not utilize turnover to identify overconfidence. According to their finding, tax avoidance is most strongly associated with managerial, that is CEO, overconfidence, in the presence of CFO overconfidence. Our study also contributes to managerial overconfidence research that focuses on non-tax corporate decisions, such as acquisitions, cash flow sensitivity, financial reporting, and non-tax risk taking.

Despite our careful identification strategy, our study has limitations. Unlike the predicted effect of CEO overconfidence on non-tax outcomes in much of the literature (e.g., Malmendier and Tate, 2005, 2008 ; Schrand and Zechman, 2012), a link between overconfidence and tax avoidance need not suggest suboptimal firm outcomes. While it could be that CEO overconfidence leads to an overestimation of the benefits of tax avoidance, underestimation of the costs of tax avoidance, or both, overconfident managers might be more comfortable for managing the research risk, tax costs executed by tax authority, and technical complexities inherent in tax policy. We cannot observe the full effects of examinations, settlements, and litigation with tax authorities.

This study proceeds as follows. The next section reviews prior literature which motivates our hypotheses, and section 3 describes our research

design. Section 4 presents our main results, and section 5 describes our additional analyses. Section 6 summarizes our results and concludes the paper.

2 Literature Review and Hypothesis Development

2.1 Description of Management with Overconfidence

In social psychology, overconfidence belongs to the field of self-evaluation study. In general, self-evaluation is influenced by the presence of significant others (Baldwin et al., 1990). Tesser modeled the psychological mechanism by which self-evaluation is maintained as a self-evaluation maintenance model (Tesser, 1988, etc.). His model assumes that “relationship with others affects self-assessment” and “individual maintains/increases self-assessment.” The relationship with others is explained by the “comparison process” and the “reflection process.” The comparison process is that the psychologically closed others would lower their own evaluation for their superior behavior, or raise their own evaluation for their inferior behavior. Generally, managerial overconfidence involves the self-evaluation of management. In this regard, persons with positive self-assessment are inclined to tackle tasks persistently and attempt to raise the possibility of success (Taylor and Brown, 1988). Moreover, such positive self-evaluated persons have a sound body and mentality in general.

Overconfidence, however, is associated with some drawbacks. Robins and Beer (2001) indicate that positive beliefs, regardless of their basis, have positive consequences, but they do not identify a subset of individuals whose positive beliefs about themselves are unacceptable. In addition, they demonstrate that previous studies documenting a link between positive illusions and adaptive outcomes rely on self-report measures of adjustment, but individuals inclined to positive illusions may also aggressively inflate their self-beliefs (Shedler, Mayman, & Manis, 1993). In other words, positive illusions may reflect a more general tendency to bolster self-esteem by denying information. Thus, some of the supposed benefits of positive illusions, such as subjective well-being, may reflect defensive denial, rather than actual psychological adjustment. Paulhus, D.L. (1998) show that defensive mecha-

nisms play an important role in character formation. Defensive mechanisms have a decisive function for self-evaluation, and this improves self-confidence. In this study, we focus on overconfidence affecting management decision making.

In order to develop our empirical predictions, we use a theoretical model derived from Malmendier and Tate (2005). Their model adopts an efficient capital market in which there are two types of CEO : rational CEOs and overconfident CEOs. Both CEO types maximize shareholder value. The only friction in the model comes from the overconfident CEO's perception about the firm's future cash flows ; that is, overconfident CEOs overestimate the firm's future cash flows. This implies that : (i) overconfident CEOs assess their firm as being undervalued by the market (Malmendier and Tate, 2005) ; and (ii) overconfident CEOs undervalue the cost of capital required by creditors and equity investors for providing external financing to the firm (Malmendier et al., 2011 ; Aktas, Louca, and Petmezas, 2019). An important implication of this theoretical framework is that the impact of CEO overconfidence on firm investment and the marginal value of cash will depend on the positive future outlook (Ahmed and Duellman, 2012) and low future sales forecast (Schrand and Zechman, 2012).

Kubick and Lockhart (2017) focus on overconfidence, as overconfident CEOs tend to overestimate their ability to generate favorable outcomes from their decisions. They depend on a shock to the status of the CEO to establish a robust link between CEO overconfidence and the firm's tax policy. Corporate taxes provide an interesting setting in which to examine the effect of overconfidence on managerial behavior, as taxes represent a significant cost to the firm, and aggressive tax policies can increase internal cash flows, thereby lessening investment funding constraints. Their research examines CEO characteristics in general, and CEO overconfidence suffers from an identification problem in that, in the absence of a shock, it is difficult to separate CEO characteristics from firm characteristics and incentives. They address this issue by using CEO awards conferred by major media outlets as an exogenous shock to CEO overconfidence. Given the economic importance of corporate tax policy, they investigate whether this shock to overcon-

confidence leads to a more aggressive tax policy. They demonstrate strong evidence in favor of this hypothesis.

From these findings, there is inclination of overconfident managers when management attempts to undertake an investment project. They are inclined to exhibit a risky behavior and positive attitude in that situation.

Extremely optimistic individuals tend to overestimate the net discounted expected payoff from investments, either because of a general tendency to expect good outcomes, or because they overestimate their own efficacy for success (Hirshleifer et al., 2012 ; Weinstein, 1980).

Hence, prior research has documented positive associations between CEO overconfidence and risk-taking behavior (Ben-David, Graham, and Harvey, 2013 ; Hirshleifer et al., 2012). For corporate tax policy, we predict that over-optimism leads to higher levels of tax aggressiveness. This could be the result of managers overestimating returns to investments in tax planning, underestimating non-tax costs, or a combination of both. Evidence in support of this prediction would help us better understand underlying behavioral explanations behind findings in the literature that suggest individual executives are associated with investment in tax aggressiveness (Dyreng et al., 2010 ; Chyz et al., 2013, 2018).

Overconfidence is likely to change expectations of subjective probabilities of occurrence, which should result in higher expected net returns to tax avoidance. Alternatively, overconfident CEOs might correctly estimate the costs and benefits associated with tax avoidance and simply have a better need for tax avoidance strategies. Nevertheless, we expect that managerial overconfidence is positively associated with corporate tax avoidance.

2.2 Hypothesis Development

According to Chyz et al. (2019), CEO overconfidence might result in tax avoidance. They indicate a direct association could exist because the net expected returns (higher returns or lower costs) to tax avoidance increase with CEO overconfidence. The returns to tax avoidance consist of reduced accounting tax expense and reduced cash tax outflows. The costs of tax avoidance include explicit tax costs, to the extent that tax positions are over-

turned, and other costs, such as tax strategy implementation costs (e.g., promoter and attorney fees), implicit taxes, costs of IRS audits and subsequent litigation (e.g., accounting and legal fees), and reputational penalties. Therefore, we believe that overconfidence could change expectations of the amounts of these benefits and costs, their subjective probabilities of occurrence, or both.

Hsieh, Wang, and Demirkan (2018) explore the association between CEO/CFO overconfidence and company tax avoidance. They study the effect of both CEOs and CFOs on firm tax avoidance when CEOs and CFOs possess similar or different overconfidence traits. To assess tax avoidance behavior, they use two long-run tax-avoidance measures, and an equity-based overconfidence measure to identify overconfident CEOs and CFOs. Their results suggest that companies with both overconfident CEOs and overconfident CFOs are more likely to engage in tax-avoidance compared to companies with other CEO/CFO overconfidence combinations. They find that although CEOs might not possess tax expertise, they affect companies' tax behavior by a mindset which promotes tax avoidance (Olsen and Stekelberg, 2016). This study also explains that overconfident CFOs play an important role in facilitating overconfident CEOs to perform the tax avoidance that the CEO promotes.

It seems that overconfident management have a strong sense of self-affirmation, are not interested in external evaluations and opinions, and tend to be less interested in benchmark performance because they are optimistic about future performance. Overconfident managers enjoy higher risk projects, such as tax avoidance (to lower the tax burden and increase shareholder value), which triggers scrutiny by tax authorities (Chyz et al. 2014, 2018 ; Kubick and Lockhart, 2017, etc.). In the general context of accounting and finance, tax avoidance is seen as "risk investment actions" (Mills, Erickson, and Maydew, 1998). It is not only the economic environment but also management's own characteristics, preferences, and incentives to allocate resources for tax avoidance. For example, Rego and Wilson (2012) use six metrics of tax avoidance behavior to show a positive relationship between tax avoidance and CEO and CFO compensation. The determi-

nant of the reward level depends on risk tolerant attitude. Managers who are overconfident tend to overestimate the return on investment from investing in tax avoidance compared to subsequent research risks (Hirshleifer et al. 2012 ; Gallemore, Maydew, and Thornock, 2014 ; Rego and Wilson, 2012, etc.). Following these findings, we present the following hypothesis :

Hypothesis 1 : Firms with overconfident managers are more likely to engage in corporate tax avoidance.

Shareholders act as a restraining function against the risk-seeking attitude of overconfident managers. We can consider a monitoring function based on corporate governance. For external monitoring, we have external oversight from institutional investors and outside directors. On the other hand, for internal monitoring, we have company directors and corporate, internal auditors (audit committee).

Monitoring through institutional investors, outside directors, and remuneration schemes can constrain overconfident managers (Humphery-Jenner, Lisic, Nanda, and Dino Silveri, 2016 ; McCarthy, Oliver, and Song, 2017).

We postulate that external monitoring forces overconfident managers to align their own interests with those of shareholders (alignment effect). This corporate governance function can weaken aggressive corporate behavior from risk-seeking overconfident managers. Accordingly, we propose the second hypothesis :

Hypothesis 2 : Firms with overconfident managers become more or less aggressive about tax avoidance activity according to the strength of the monitoring function.

We recognize therefore that companies need to support the function of external monitoring. In particular, we believe that the strengthening of monitoring functions affects the behavior of overconfident managers (Goel and Thakor, 2008). In this respect, we recall the following proposition that the intensity of monitoring function varies with the stage of the organization.

We conjecture that there will be differences in the aggressiveness of tax reduction actions by overconfident managers depending on the commitment level of outside directors and institutional investors.

On the other hand, it is believed that managers' aggressiveness in pursuit of tax avoidance also depends on, for example, the tax burden ratio. The guidance provided by external monitoring seems to be important in order to advance corporate strategy so as to respect the interests of shareholders when there are overconfident managers. Moreover, the degree of tax avoidance is considered to reflect the risk profile of companies. Therefore, we speculate that risky managers' attitudes, that is, the degree of overconfidence, will change according to the current tax burden ratio.

Hypothesis 3 : Management overconfidence depends on the state of corporate tax avoidance behavior.

3 Data, Measures, and Research Design

3.1 Data

We obtain Japanese firms' financial data from the Nikkei NEEDS-Financial Quest Ver.2.0, and corporate governance data from the Nikkei NEEDS-Cges, for the period 2007–2017. Table 1 describes our sample selection criteria. In the sample selection process, we exclude firm data whose accounting months are less and more than 12 months. This yields a final sample between 2007 and 2017 firm-year observations which is relevant for all the analysis. The sample selection process follows the settings in Table 1.

3.2 Research Design

Firstly, this study investigates hypothesis 1 : whether overconfident managers execute tax avoidance aggressively. Chyz et al. (2014, 2019) attempt to address these issues. They utilize a general measure, Holder67, which represents the extent of managerial overconfidence. Malmendier and Tate (2005) initially used Holder67, which focuses on the exercise status of stock options using the overconfidence indicator. However, we cannot utilize this measure due to a limitation of data on stock option practices in Japan ;

Table 1 Sample selection

sample selection	firm-year
Japanese listed firms excluding bank, securities, insurance and other financial business from 2007 to 2017.	36270
The fiscal year is not 12 months.	273
	35997
cannot calculate 1 year ETRs and contorol valuables	8063
	27934
cannot calculate 3 year ETRs and contorol valuables	3697
	24237
cannot calculate 5 year ETRs and contorol valuables	6128
	18109

therefore, we need to rely on another benchmark. Finally, this study depends on other measures such as Overconfident (OC) Firm4 and OC Firm5 that Schrand and Zechman (2012) initially developed.

Our research design is as follows :

$$\begin{aligned}
 ETR_{i,t} &= \alpha_0 + \alpha_1 OC_{i,t} + \sum \alpha Contorols + \sum \alpha Year + \sum \alpha Industry + \varepsilon_{i,t} \\
 ETR_{i,t} &\in \{Gaap\ ETR, Current\ ETR\} \\
 OC_{i,t} &\in \{OC\ Firm4, OC\ Firm5\}
 \end{aligned} \tag{1}$$

In Equation (1), i and t represent accounting year and firm, respectively. The tax avoidance variable (ETR) uses Gaap ETR and Current ETR. Gaap ETR (Frank et al., 2009) is the adjusted amount of corporate tax, etc., added to tax costs, minus net profit before tax for the current term. Current ETR (Hanlon and Heitzman, 2010) is tax costs minus net profit before tax for the current term. In verifying long-term tax avoidance, moreover, this paper takes uses ETR dependent variable, calculated from the 3- and 5-year tax costs advocated by Dyreng et al. (2008) and net profit before tax for the

current term. In accordance with previous research, variables for these tax avoidance periods are set as 0 where the value is 0 or less, and 1 when it is 1 or more.

OC Firm4 and OC Firm5 focus on five managerial behaviors : ① aggressive capital investment (X Invest INDADJ), ② aggressive acquisitions (Intangible INDADJ), ③ high leverage (DE ratio INDADJ), ④ fundraising through risky debt and ⑤ payout ratio (DVVLD). X Invest INDADJ assumes the residual balance from a regression equation with rate of sales growth as an independent variable and capital investment costs as a dependent variable, which is adjusted, following regression analysis, for median value by industry. Intangible INDADJ is the amount of investment in intangible assets, according to cash flow statements, adjusted for median value by industry. DE ratio INDADJ is the leverage from total debt (long-term debt plus short-term debt) minus total market-value plus long-term debt and adjusted for median value by industry. Risky debt, in the case of firms issuing blue-chip stocks or convertible debentures, or both, is a dummy variable of 1 or 0. DIVVLD is the number of dividends obtained from cash flow statements. If OC Firm4 satisfies at least 2 of the following conditions : (1) X Invest INDADJ is 0 or more, (2) Intangible INDADJ is 0 or more, (3) DE ratio INDADJ is 0 or more and (4) risky debt is 1 – one dummy variable will be 1, and the others 0. If, for OC Firm5, (5) DVVLD = 0 is added to the 4 conditions used in determining OC Firm4, and OC Firm5 satisfies at least 3 of these 5 conditions, one dummy value will be 1, and the others 0. Verification results for this paper's Hypothesis 1 show that tax avoidance occurs to the extent that Gaap ETR and current ETR are low, and that if overconfident managers carry out tax avoidance, $\alpha < 0$ is predicted.

Regarding with control variables, we control tax avoidance incentives, according to Chyz et al. (2014). Business results are shown by dividing cash flow through CFO managerial activity by total assets. It is possible that firms with high-level business results generate tax aggressive behaviors (Gupta and Newberry, 1997).

Leverage consists of long-term debt plus short-term debt divided by total assets. By substituting debt-employing tax shields for other tax avoidance

methods, highly leveraged firms do not aggressively avoid taxes (Graham and Tucker, 2006). Moreover, as bank borrowing costs rise, so does the possibility of such tax avoidance (Hasan, Hoi, Wu and Zhang, 2014). NOL represents losses brought forward divided by total assets. Δ NOL is losses brought forward for the previous term minus losses brought forward for the current term, divided by total assets. Erickson, Heitzman and Zhang (2013) have claimed that firms with losses attempt to obtain short-term cash by booking more losses carried forward. 'Foreign sales ratio' is the rate of sales overseas. While overseas managerial activities probably encourage tax burden reduction through profit transfer, managerial activities in jurisdictions with lower taxes than the countries in which head offices are based will decrease the incentives for profit transfer (De Simone, Mills and Stormberg, 2019).

This paper controls PPE and Intangibles as asset structure. PPE is the book value of fixed (tangible) assets divided by total assets. Mills, Erickson and Maydew (1998) have verified that tax planning is possible by adjusting the timing of tangible, fixed asset acquisition and processing. Intangibles are the book value of fixed (intangible) assets divided by total assets. Desai and Goolsbee (2004) have verified that the shorter depreciable life of these assets acts as an incentive to adjust taxable income by distribution of costs through depreciation.

Finally, we control corporate characteristics. Size consists of the natural logarithm of total assets. Business scale represents the frequency of tax avoidance opportunities and is a factor in aggressive tax avoidance (Rego, 2003). Equity income is investment profit divided by total assets, according to the equity method. MB, representing corporate growth potential, is the market-book value ratio. These control variables, excluding dummy variables, are winsorized above or below 1%. In addition, this paper's analysis controls the fixed effects of 'Year' and 'Industry.'

For verification of Hypothesis 2, we use this following research design, which added cross terms to the variables explaining strong, external monitoring and representing overconfident managers in Hypothesis 1.

$$\begin{aligned}
ETR_{i,t} &= \beta_0 + \beta_1 OC_{i,t} + \beta_2 OC_{i,t} * Strong\ Monitor_{i,t} + \beta_3 Strong\ Monitor_{i,t} \\
&\quad + \sum \beta\ Contorols + \sum \beta\ Year + \sum \beta\ Industry + \varepsilon_{i,t} \\
ETR_{i,t} &\in \{Gaap\ ETR, Current\ ETR\} \\
OC_{i,t} &\in \{OC\ Firm4, OC\ Firm5\} \\
Strong\ Monitor_{i,t} &\in \{High\ INST, High\ ID\}
\end{aligned} \tag{2}$$

Equation (2) uses the same variables as Equation (1), except for Strong Monitor_{i,t}, including High INST and high ID. If the High INST-value for the institutional investor ratio in the sample is higher than the median value, a dummy variable will be 1 and the remainder 0. If the High INST-value for outside director ratio in the sample is higher than the median value, a dummy variable will be 1 and the remainder 0.

Strong monitoring by institutional investors and outside directors restrain tax avoidance behaviors. Desai and Dharmapala (2006) have differentiated tax avoidance using tax shelters by managers with compensation optimized through incentive contracts, and control of these behaviors through strengthening of corporate governance by institutional investor monitoring. Lanis and Richardson (2011) have examined mitigation of tax avoidance through outside directors and board structure that exercise a monitoring role. This paper's demonstration predicts that, where the effect on tax avoidance by overconfident managers through strong, external monitoring is relaxed, β_2 will be larger than β_1 .

To verify Hypothesis 3, we use quantile regression to categorize the aggressiveness of tax avoidance. The variables used in the analysis are as per Equation (1). The quantiles used in the analysis are the 25th, 50th and 75th percentiles. If Hypothesis 3 is correct, then the lowest percentile (the 25th) will show the strongest effect on tax avoidance by overconfident managers.

3.3 Descriptive Statistics and Correlation Matrix

Descriptive statistics are displayed in Table 2. The Gaap ETR mean value (median value) is 0.333 (0.346), and Current ETR mean value (median value) is 0.354 (0.377). In Chyz et al. (2014), Cash ETR has a mean value

(median value) of 0.357 (0.275).

For any of the variables indicating overconfident managers, 50% or more of managers in the samples are estimated as exhibiting overconfidence. OC Firm4 and OC Firm5 mean values are 0.513 and 0.547, respectively. Indices measuring managerial overconfidence in this paper's analysis, in contrast with the approximately 66% sample share of overconfident managers in previous research hypotheses (Chyz et al., 2019) verified by Malmendier and Tate's (2005) Holder67, determines a lower percentage of overconfident managers. The sample selection process of this paper differs from Chyz et al., 2019, as they sampled only managers who were the product of a non-compulsory change of staff.

Table 2 Descriptive statistics

valuable name	N	mean	min	median	max	sd
Gaap_ETR	27934	0.333	0.000	0.346	1.000	0.222
Current_ETR	27934	0.354	0.000	0.377	1.000	0.221
Gaap_ETR3	24237	0.355	0.000	0.360	1.000	0.223
Current_ETR3	24237	0.369	0.000	0.378	1.000	0.230
Gaap_ETR5	18109	0.369	0.000	0.370	1.000	0.211
Current_ETR5	18109	0.383	0.000	0.388	1.000	0.220
OC Firm4	27934	0.513	0.000	1.000	1.000	0.500
OC Firm5	27934	0.547	0.000	1.000	1.000	0.498
CFO	27934	0.055	-2.413	0.057	0.255	0.066
Leverage	27934	0.191	0.000	0.152	0.771	0.174
NOL	27934	0.027	0.000	0.004	0.972	0.073
Δ NOL	27934	0.000	-4.056	0.000	0.133	0.036
Foreign Sales Ratio	27934	0.133	0.000	0.000	0.843	0.210
PPE	27934	0.283	0.000	0.267	0.824	0.179
Intangible	27934	0.024	0.000	0.010	0.298	0.039
Equity Income	27934	0.001	0.000	0.000	0.014	0.002
Size	27934	10.604	5.624	10.489	14.904	1.509
MB	27934	1.154	0.000	0.847	9.358	1.020

Notes : Definitions of variables are based on those found in Appendix A.

Table 3 shows the Pearson correlation coefficient chart. Our research verifies Hypothesis 1 of tax avoidance by overconfident managers. Gaap ETR and OC Firm4 have a negative correlation. Gaap ETR has a negative correlation to OC Firm5, while Current ETR also has a negative correlation to OC Firm4 and OC Firm5. Given the above, it is probable that tax avoidance behaviors by overconfident managers support Hypothesis 1.

Table 3 Pearson correlation matrix

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
[1] Gaap_ETR	1.000						
[2] Current_ETR	0.692	1.000					
[3] Firm4	-0.071	-0.046	1.000				
[4] Firm5	-0.110	-0.092	0.935	1.000			
[5] CFO	0.149	0.108	-0.132	-0.164	1.000		
[6] Leverage	-0.096	-0.074	0.388	0.396	-0.165	1.000	
[7] NOL	-0.254	-0.260	0.066	0.161	-0.208	0.095	1.000
[8] ΔNOL	-0.013	-0.012	0.013	0.007	0.004	0.028	-0.043
[9] Foreign Sales Ratio	-0.078	-0.096	-0.025	-0.032	0.071	-0.025	0.011
[10] PPE	0.003	0.015	0.150	0.125	0.124	0.370	-0.104
[11] Intangible	0.062	0.044	-0.069	-0.048	0.099	0.008	0.087
[12] Equity Income	-0.037	-0.037	-0.002	-0.009	0.023	0.002	-0.030
[13] Size	0.061	0.066	-0.020	-0.071	0.080	0.078	-0.208
[14] MB	0.006	-0.034	-0.095	-0.053	0.138	0.067	0.126
	[8]	[9]	[10]	[11]	[12]	[13]	[14]
[8] ΔNOL	1.000						
[9] Foreign Sales Ratio	0.024	1.000					
[10] PPE	0.020	-0.031	1.000				
[11] Intangible	-0.006	-0.035	-0.199	1.000			
[12] Equity Income	0.001	0.106	-0.001	-0.010	1.000		
[13] Size	0.027	0.253	0.187	-0.022	0.167	1.000	
[14] MB	-0.039	-0.006	-0.119	0.237	-0.018	-0.082	1.000

Notes : Definitions of variables are based on those found in Appendix A.

4 Results

4.1 Tax Avoidance Made by Overconfident Managers

Table 4 displays the verification results of Hypothesis 1. Analysis taking Gaap ETR as a dependent variable shows an OC Firm4 coefficient (t-value) of -0.007 (-2.48), with 5% significance, and an OC Firm5 coefficient (t-value) of -0.015 (-5.26), with 1% significance. Analysis taking Current ETR as a dependent variable yields an OC Firm4 coefficient (t-value) of -0.003 (-1.33), not a statistically significant result. The OC Firm5 coefficient (t-value) is -0.015 (-5.28), a result with 1% significance.

The tendency for overconfident managers to engage in tax avoidance can be seen from the above results. In particular, analysis using OC Firm5 indicates, for all analysis using tax avoidance indices, the effect of significance and a negative coefficient. For OC Firm4, while significant results are not obtained, the same negative coefficient is found. These results use Japanese data to support the analysis by Chyz et al. (2019) on whether overconfident managers cause tax avoidance.

Table 5, using the ETR in Table 4, but over a 3-year period, verifies Hypothesis 1. Analysis taking Gaap ETR3 as a dependent variable yields an OC Firm4 coefficient (t-value) of -0.002 (-0.57), not a significant result. The OC Firm5 coefficient (t-value) is -0.012 (-3.96), for 1% significance. Taking Current ETR3 as a dependent variable, yields an OC Firm4 coefficient (t-value) of 0.001 (-0.23), like Gaap ETR3 used as an index of tax avoidance, not a significant result. The OC Firm5 coefficient (t-value) is -0.013 (-4.15), for 1% significance.

Table 5 shows the results, not performed in previous research, on the effect of long-term tax avoidance by overconfident managers. For analysis using OC Firm5, the results suggest, in the same way as Table 4, that overconfident managers aggressively conduct tax avoidance.

Finally, Table 6, using the ETR in Table 4, but over a 5-year period, verifies Hypothesis 1. Analysis taking Gaap ETR5 as a dependent variable yields an OC Firm4 coefficient (t-value) of -0.003 (-1.03), not a statistically significant result. The OC Firm5 coefficient (t-value) is -0.011 (-3.32), for 1%

Table 4 Tax avoidance by overconfident CEO

	Gaap_ETR		Current_ETR	
	(1)	(2)	(3)	(4)
OC Firm4	-0.007** (-2.48)		-0.004 (-1.33)	
OC Firm5		-0.015*** (-5.26)		-0.015*** (-5.28)
CFO	0.297*** (12.86)	0.293*** (12.7)	0.190*** (8.22)	0.185*** (7.99)
Leverage	-0.081*** (-7.74)	-0.071*** (-6.75)	-0.059*** (-5.51)	-0.045*** (-4.16)
NOL	-0.661*** (-26.80)	-0.651*** (-26.37)	-0.682*** (-26.38)	-0.672*** (-25.93)
ΔNOL	-0.131 (-1.45)	-0.132 (-1.46)	-0.132 (-1.38)	-0.133 (-1.39)
Foreign Sales Ratio	-0.043*** (-5.76)	-0.044*** (-5.82)	-0.065*** (-8.45)	-0.066*** (-8.54)
PPE	-0.031*** (-3.22)	-0.031*** (-3.18)	-0.031*** (-3.15)	-0.030*** (-3.09)
Intangible	0.275*** (6.78)	0.270*** (6.65)	0.268*** (6.59)	0.260*** (6.40)
Equity Income	-5.521*** (-8.48)	-5.499*** (-8.45)	-5.730*** (-8.67)	-5.702*** (-8.64)
Size	0.009*** (8.65)	0.008*** (8.45)	0.009*** (9.04)	0.009*** (8.83)
MB	-0.002 (-1.62)	-0.003* (-1.81)	-0.007*** (-4.58)	-0.007*** (-4.94)
cons	0.252*** (4.62)	0.257*** (4.69)	0.168*** (2.92)	0.175*** (3.02)
Year dummy	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes
N	27934	27934	27934	27934
ADJ. R2	0.112	0.113	0.111	0.112

Notes: (1) and (2) show OLS results on Gaap ETR as a dependent variable. (3) and (4) show OLS results on Current ETR as a dependent variable. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-value stands for White's robust t-value.

Table 5 Long term tax avoidance by overconfident CEO

	Gaap_ETR3		Current_ETR3	
	(5)	(6)	(7)	(8)
OC Firm4	-0.007** (-2.48)		-0.004 (-1.33)	
OC Firm5		-0.015*** (-5.26)		-0.015*** (-5.28)
CFO	0.297*** (12.86)	0.293*** (12.7)	0.190*** (8.22)	0.185*** (7.99)
Leverage	-0.081*** (-7.74)	-0.071*** (-6.75)	-0.059*** (-5.51)	-0.045*** (-4.16)
NOL	-0.661*** (-26.80)	-0.651*** (-26.37)	-0.682*** (-26.38)	-0.672*** (-25.93)
ΔNOL	-0.131 (-1.45)	-0.132 (-1.46)	-0.132 (-1.38)	-0.133 (-1.39)
Foreign Sales Ratio	-0.043*** (-5.76)	-0.044*** (-5.82)	-0.065*** (-8.45)	-0.066*** (-8.54)
PPE	-0.031*** (-3.22)	-0.031*** (-3.18)	-0.031*** (-3.15)	-0.030*** (-3.09)
Intangible	0.275*** (6.78)	0.270*** (6.65)	0.268*** (6.59)	0.260*** (6.40)
Equity Income	-5.521*** (-8.48)	-5.499*** (-8.45)	-5.730*** (-8.67)	-5.702*** (-8.64)
Size	0.009*** (8.65)	0.008*** (8.45)	0.009*** (9.04)	0.009*** (8.83)
MB	-0.002 (-1.62)	-0.003* (-1.81)	-0.007*** (-4.58)	-0.007*** (-4.94)
cons	0.252*** (4.62)	0.257*** (4.69)	0.168*** (2.92)	0.175*** (3.02)
Year dummy	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes
N	27934	27934	27934	27934
ADJ. R2	0.112	0.113	0.111	0.112

Notes: (5) and (6) show OLS results on Gaap ETR3 as a dependent variable. (7) and (8) show OLS results on Current ETR3 as a dependent variable also. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-value stands for White's robust t-value.

Table 6 Long term tax avoidance by overconfident CEO

	Gaap_ETR5		Current_ETR5	
	(9)	(10)	(11)	(12)
OC Firm4	-0.003 (-1.03)		0.001 (0.32)	
OC Firm5		-0.011*** (-3.32)		-0.010*** (-2.95)
CFO	0.217*** (6.95)	0.214*** (6.84)	0.164*** (5.00)	0.159*** (4.87)
Leverage	-0.013 (-1.03)	-0.003 (-0.24)	-0.017 (-1.25)	-0.001 (-0.11)
NOL	-0.605*** (-19.12)	-0.596*** (-18.82)	-0.647*** (-18.98)	-0.638*** (-18.67)
ΔNOL	-0.073 (-1.43)	-0.075 (-1.45)	-0.094 (-1.40)	-0.096 (-1.41)
Foreign Sales Ratio	-0.044*** (-4.48)	-0.045*** (-4.53)	-0.052*** (-5.07)	-0.053*** (-5.15)
PPE	-0.037*** (-3.02)	-0.036*** (-2.98)	-0.046*** (-3.68)	-0.045*** (-3.62)
Intangible	0.231*** (4.38)	0.225*** (4.28)	0.193*** (3.50)	0.184*** (3.33)
Equity Income	-5.562*** (-6.81)	-5.551*** (-6.80)	-5.267*** (-6.19)	-5.255*** (-6.18)
Size	0.005*** (4.03)	0.005*** (3.91)	0.007*** (5.41)	0.007*** (5.29)
MB	0.002 (0.88)	0.002 (0.71)	-0.003 (-1.49)	-0.004* (-1.79)
cons	0.399*** (6.50)	0.404*** (6.62)	0.345*** (5.42)	0.351*** (5.57)
Year dummy	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes
N	18109	18109	18109	18109
ADJ. R2	0.083	0.083	0.086	0.086

Notes: (9) and (10) show OLS results on Gaap ETR5 as a dependent variable. (3) and (4) show OLS results on Current ETR5 as a dependent variable also. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-value stands for White's robust t-value.

significance. Analysis, taking Current ETR5 as a dependent variable, yields an OC Firm4 coefficient (t-value) of 0.001 (-0.32), like Gaap ETR5 used as a tax avoidance index, not a significant result. The OC Firm5 coefficient (t-value) is -0.013 (-2.95), for 1% significance. These results show a trend toward the same results as ETR3.

4.2 Restraint of Overconfident Managers by External Monitoring

Table 7 investigates Strong Monitor from the above equation (2) as High INST. Analysis taking Gaap ETR as a dependent variable yields a coefficient (t-value) for the OC Firm4 independent variable of 0.011 (-2.45), for 5% significance. The coefficient (t-value) of the cross term for OC Firm4 and High INST is 0.007 (1.39), not a significant result. The coefficient (t-value) of the independent variable OC Firm5 is -0.023 (-5.17), for 1% significance. The coefficient (t-value) of the cross term for OC Firm5 and High INST is 0.014 (2.55), with 5% significance.

Examination with Current ETR used as a dependent variable yields an OC Firm4 coefficient (t-value) of 0.008 (-1.85), for 10% significance. The coefficient (t-value) of the cross term for OC Firm4 and High INST was 0.010 (1.82), for 10% significance. The coefficient (t-value) of the independent variable OC Firm5 was -0.025 (-5.74), for 1% significance. The coefficient (t-value) of the cross term for OC Firm5 and High INST is 0.019 (3.59), a result with 1% significance.

While the OC Firm4 and OC Firm5 coefficients in the above analysis do not differ from the verification results for Hypothesis 1, removal of the influence of overconfident managers (not significant results) and inversion of the significance/coefficient relationship are apparent when the cross term with High INST is applied. Thus, the analytical results in Table 7 indicate that, while overconfident managers conduct aggressive tax avoidance when monitoring is weak, the possibility of aggressive tax avoidance behaviors weakens when monitoring is strong. These empirical results support Hypothesis 2 and from the perspective of tax avoidance behaviors, support previous research such as Humphery-Jenner et al. (2016), showing that external monitoring deters aggressive behavior by overconfident managers.

Table 7 Effect of institutional ownership for tax avoidance of overconfident CEO

	Gaap_ETR		Current_ETR	
	(13)	(14)	(15)	(16)
OC Firm4	-0.011** (-2.45)		-0.008* (-1.85)	
OC Firm4 *High INST	0.007 (1.39)		0.010* (1.82)	
OC Firm5		-0.023*** (-5.17)		-0.025*** (-5.74)
OC Firm5 *High INST		0.014** (2.55)		0.019*** (3.59)
High INST	0.006 (1.36)	0.002 (0.38)	-0.003 (-0.63)	-0.008** (-2.10)
CFO	0.296*** (12.34)	0.291*** (12.18)	0.189*** (7.89)	0.183*** (7.66)
Leverage	-0.083*** (-7.61)	-0.072*** (-6.58)	-0.068*** (-6.04)	-0.052*** (-4.63)
NOL	-0.661*** (-26.20)	-0.650*** (-25.72)	-0.680*** (-25.76)	-0.666*** (-25.24)
ΔNOL	-0.129 (-1.44)	-0.129 (-1.44)	-0.129 (-1.37)	-0.129 (-1.38)
Foreign Sales Ratio	-0.047*** (-5.95)	-0.048*** (-6.00)	-0.069*** (-8.56)	-0.069*** (-8.63)
PPE	-0.032*** (-3.15)	-0.032*** (-3.11)	-0.031*** (-2.98)	-0.030*** (-2.91)
Intangible	0.268*** (6.33)	0.261*** (6.18)	0.260*** (6.13)	0.249*** (5.89)
Equity Income	-5.685*** (-8.28)	-5.663*** (-8.25)	-5.946*** (-8.50)	-5.921*** (-8.47)
Size	0.008*** (6.29)	0.008*** (6.12)	0.010*** (7.66)	0.009*** (7.47)
MB	-0.003** (-1.97)	-0.003** (-2.08)	-0.007*** (-4.79)	-0.007*** (-5.03)
cons	0.247*** (13.50)	0.255*** (13.89)	0.233*** (12.97)	0.243*** (13.51)
Year dummy	yes	yes	yes	yes
industry dummy	yes	yes	yes	yes
N	25890	25890	25890	25890
ADJ. R2	0.114	0.115	0.110	0.111

Notes: (13) and (14) show OLS results on Gaap ETR as a dependent variable. (15) and (16) show OLS results on Current ETR as a dependent variable also. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-value stands for White's robust t-value.

Further, these results supplement Chyz et al. (2019).

Table 8 applies the same analysis as Table 7 but extends ETR from 1 to 3 years. Taking OC Firm4 as an independent variable does not produce significant results. Taking OC Firm5 as an independent variable resulted in an OC Firm5 coefficient of 1% significance, and a negative value, where either Gaap ETR3 and Current ETR3 are dependent variables. Where the dependent variable is Gaap ETR3, the coefficient of the cross term for OC Firm5 and High INST is not significant, but was 5% significant and positive where the dependent variable is Current ETR5.

The research in Table 9 extends the dependent variable in Table 7 from 1-year to 5-year ETR. When OC Firm4 is the independent variable results are not significant. Analysis taking OC Firm5 as an independent variable result in an OC Firm5 coefficient of 1% significance, and a negative value when either Gaap ETR5 or Current ETR5 are dependent variables. Where the dependent variable is Gaap ETR5, the coefficient of the cross term for OC Firm5 and High INST is 10% significant and positive, while it is 5% significant and has a positive value where the dependent variable is Current ETR3.

Examination using 3-year ETR and 5-year ETR as dependent variables, and OC Firm5 as an independent variable, produce results supporting the hypothesis. In summary, results showing suppression of aggressive tax avoidance, in the case of long-term tax management strategies also, by external monitoring, are unchanged. However, robust results are not obtained by analysis using OC Firm4.

Table 10 researches Strong Monitor from the above equation (2) as High ID. Analysis taking Gaap ETR as a dependent variable yields a coefficient (t-value) of OC Firm4 of 0.015 (-3.98), for 1% significance. The coefficient (t-value) of the cross term for the equation's OC Firm4 and High INST is 0.017 (3.38), for 1% significance. The coefficient (t-value) of OC Firm5 is -0.022 (-5.99), with 1% significance. The coefficient (t-value) of the cross term for the equation's OC Firm5 and High INST is 0.016 (3.19), with 1% significance.

Analysis with Current ETR used as a dependent variable yields an OC

Table 8 Effect of institutional ownership for long term tax avoidance of overconfident CEO

	Gaap_ETR3		Current_ETR3	
	(17)	(18)	(19)	(20)
OC Firm4	-0.001 (-0.22)		-0.002 (-0.44)	
OC Firm4 *High INST	-0.002 (-0.35)		0.002 (0.28)	
OC Firm5		-0.015*** (-3.31)		-0.020*** (-4.20)
OC Firm5 *High INST		0.005 (0.91)		0.011** (1.98)
High INST	-0.006 (-1.36)	-0.010** (-2.31)	-0.015*** (-3.51)	-0.021*** (-4.82)
CFO	0.291*** (10.26)	0.287*** (10.13)	0.239*** (8.20)	0.234*** (8.04)
Leverage	-0.056*** (-4.75)	-0.043*** (-3.60)	-0.047*** (-3.82)	-0.030** (-2.47)
NOL	-0.620*** (-20.19)	-0.610*** (-19.80)	-0.643*** (-19.67)	-0.630*** (-19.24)
ΔNOL	-0.097 (-0.97)	-0.098 (-0.98)	-0.114 (-1.05)	-0.115 (-1.06)
Foreign Sales Ratio	-0.042*** (-4.84)	-0.042*** (-4.90)	-0.049*** (-5.52)	-0.050*** (-5.58)
PPE	-0.041*** (-3.78)	-0.040*** (-3.73)	-0.043*** (-3.82)	-0.042*** (-3.75)
Intangible	0.313*** (6.68)	0.303*** (6.48)	0.246*** (5.08)	0.233*** (4.83)
Equity Income	-7.307*** (-11.42)	-7.297*** (-11.42)	-6.654*** (-9.42)	-6.640*** (-9.41)
Size	0.008*** (5.97)	0.008*** (5.83)	0.011*** (8.30)	0.011*** (8.14)
MB	-0.002 (-1.26)	-0.003 (-1.48)	-0.006*** (-3.32)	-0.006*** (-3.59)
cons	0.323*** (8.17)	0.333*** (8.39)	0.277*** (7.43)	0.290*** (7.71)
Year dummy	yes	yes	yes	yes
industry dummy	yes	yes	yes	yes
N	24107	24107	24107	24107
ADJ. R2	0.095	0.095	0.097	0.098

Notes: (17) and (18) show OLS results on Gaap ETR3 as a dependent variable. (19) and (20) show OLS results on Current ETR3 as a dependent variable also. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-value stands for White's robust t-value.

Table 9 Effect of institutional ownership for long term tax avoidance of overconfident CEO

	Gaap_ETR5		Current_ETR5	
	(21)	(22)	(23)	(24)
OC Firm4	-0.006 (-1.31)		-0.004 (-0.79)	
OC Firm4 *High INST	0.006 (1.02)		0.010 (1.55)	
OC Firm5		-0.017*** (-3.39)		-0.021*** (-4.01)
OC Firm5 *High INST		0.0110* (1.76)		0.019*** (3.03)
High INST	-0.004 (-0.80)	-0.007 (-1.45)	-0.012** (-2.44)	-0.018*** (-3.67)
CFO	0.218*** (6.92)	0.214*** (6.82)	0.167*** (5.06)	0.162*** (4.95)
Leverage	-0.014 (-1.08)	-0.004 (-0.29)	-0.020 (-1.47)	-0.004 (-0.31)
NOL	-0.604*** (-19.09)	-0.594*** (-18.74)	-0.647*** (-18.95)	-0.635*** (-18.58)
ΔNOL	-0.073 (-1.44)	-0.075 (-1.45)	-0.093 (-1.40)	-0.095 (-1.43)
Foreign Sales Ratio	-0.043*** (-4.34)	-0.043*** (-4.38)	-0.050*** (-4.81)	-0.050*** (-4.85)
PPE	-0.037*** (-3.03)	-0.037*** (-2.99)	-0.047*** (-3.73)	-0.046*** (-3.68)
Intangible	0.228*** (4.29)	0.220*** (4.15)	0.190*** (3.42)	0.178*** (3.19)
Equity Income	-5.545*** (-6.75)	-5.536*** (-6.74)	-5.277*** (-6.16)	-5.268*** (-6.16)
Size	0.005*** (3.43)	0.005*** (3.34)	0.008*** (5.37)	0.008*** (5.26)
MB	0.002 (0.86)	0.002 (0.74)	-0.003 (-1.33)	-0.003 (-1.52)
cons	0.357*** (20.18)	0.363*** (20.51)	0.360*** (19.73)	0.370*** (20.25)
Year dummy	yes	yes	yes	yes
industry dummy	yes	yes	yes	yes
N	18018	18018	18018	18018
ADJ. R2	0.082	0.083	0.086	0.087

Notes: (21) and (22) show OLS results on Gaap ETR5 as a dependent variable. (23) and (24) show OLS results on Current ETR5 as a dependent variable also. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-value stands for White's robust t-value.

Table 10 Effect of outside director for tax avoidance of overconfident CEO

	Gaap_ETR		Current_ETR	
	(25)	(26)	(27)	(28)
OC Firm4	-0.015*** (-3.98)		-0.008** (-2.05)	
Firm4 *High ID	0.017*** (3.38)		0.008 (1.64)	
OC Firm5		-0.022*** (-5.99)		-0.018*** (-4.91)
Firm5 *High ID		0.016*** (3.19)		0.007 (1.39)
High ID	-0.026*** (-7.48)	-0.026*** (-7.45)	-0.022*** (-6.31)	-0.021*** (-6.22)
CFO	0.296*** (12.82)	0.292*** (12.68)	0.189*** (8.15)	0.184*** (7.94)
Leverage	-0.081*** (-7.72)	-0.070*** (-6.71)	-0.059*** (-5.52)	-0.045*** (-4.17)
NOL	-0.657*** (-26.70)	-0.649*** (-26.33)	-0.680*** (-26.38)	-0.670*** (-25.95)
Δ NOL	-0.130 (-1.45)	-0.130 (-1.46)	-0.130 (-1.38)	-0.131 (-1.39)
Foreign Sales Ratio	-0.042*** (-5.58)	-0.043*** (-5.65)	-0.063*** (-8.26)	-0.064*** (-8.35)
PPE	-0.032*** (-3.30)	-0.032*** (-3.26)	-0.031*** (-3.20)	-0.031*** (-3.14)
Intangible	0.295*** (7.26)	0.289*** (7.12)	0.288*** (7.08)	0.279*** (6.88)
Equity Income	-5.419*** (-8.31)	-5.394*** (-8.28)	-5.627*** (-8.51)	-5.598*** (-8.48)
Size	0.009*** (8.98)	0.009*** (8.80)	0.009*** (9.41)	0.009*** (9.21)
MB	-0.002 (-1.32)	-0.002 (-1.58)	-0.006*** (-4.43)	-0.007*** (-4.81)
cons	0.248*** (17.51)	0.253*** (17.87)	0.240*** (16.88)	0.247*** (17.35)
Year dummy	yes	yes	yes	yes
industry dummy	yes	yes	yes	yes
N	27860	27860	27860	27860
ADJ. R2	0.114	0.115	0.113	0.114

Notes: (25) and (26) show OLS results on Gaap ETR as a dependent variable. (27) and (28) show OLS results no Current ETR as a dependent variable also. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-value stands for White's robust t-value.

Firm4 coefficient (t-value) of 0.008 (-2.05), for 5% significance. Where the dependent variable is the same, the coefficient (t-value) of the cross term for OC Firm4 and High INST is 0.010 (1.64), not a significant result. OC Firm5's coefficient (t-value) is 0.018 (-4.91), with 1% significance. The coefficient (t-value) of the equation's cross term for OC Firm5 and High INST is 0.007 (1.39), not a significant result.

From the above analysis ,even where the outside director ratio is re-defined as the external monitoring variable, the effect of aggressive tax avoidance behaviors by overconfident managers weakens according to external monitoring. Hence, these results support Hypothesis 2 in the same way as the analytical results using the institutional investor ratio.

The analysis in Table 11 extends the dependent variable in Table 10 from 1-year to 3-year ETR. Taking OC Firm4 as an independent variable did not result in significance for either the OC Firm4 or cross term coefficient. Using OC Firm5 is seen to yield 1% significance and a negative value when using either Gaap ETR5 or Current ETR5 as dependent variables. However, significant results are not obtained with cross term analysis.

The analysis in Table 12 extends the dependent variable in Table 10 from 1-year to 5-year ETR. Analysis taking OC Firm4 as an independent variable does not result in significance for either the OC Firm4 or cross term coefficients. Analysis using OC Firm5 is seen to yield 1% significance and a negative value when using either Gaap ETR5 or Current ETR5 as dependent variables. However, significant results are not obtained with cross term analysis.

Similar to using High INST, using 3-year and 5-year ETR also verifies analysis taking OC Firm5 as a variable representing overconfident managers and show that long-term tax avoidance behaviors by overconfident managers is mitigated where external monitoring is strong. However, robust empirical results are not evident from research using OC Firm4.

Table 11 Effect of outside director for long term tax avoidance of overconfident CEO

	Gaap_ETR3		Current_ETR3	
	(29)	(30)	(31)	(32)
OC Firm4	-0.002 (-0.63)		-0.000 (-0.09)	
Firm4 *High ID	0.001 (0.26)		-0.001 (-0.19)	
OC Firm5		-0.013*** (-3.24)		-0.012*** (-2.98)
Firm5 *High ID		0.001 (0.17)		-0.003 (-0.53)
High ID	-0.013*** (-3.56)	-0.013*** (-3.49)	-0.014*** (-3.72)	-0.013*** (-3.45)
CFO	0.289*** (10.25)	0.285*** (10.11)	0.232*** (8.02)	0.227*** (7.84)
Leverage	-0.053*** (-4.53)	-0.040*** (-3.40)	-0.041*** (-3.41)	-0.026** (-2.11)
NOL	-0.615*** (-20.00)	-0.606*** (-19.64)	-0.637*** (-19.50)	-0.626*** (-19.11)
ΔNOL	-0.101 (-0.99)	-0.102 (-1.00)	-0.119 (-1.07)	-0.121 (-1.09)
Foreign Sales Ratio	-0.042*** (-4.96)	-0.043*** (-5.04)	-0.052*** (-5.85)	-0.053*** (-5.95)
PPE	-0.042*** (-3.88)	-0.041*** (-3.82)	-0.042*** (-3.81)	-0.042*** (-3.73)
Intangible	0.328*** (7.00)	0.319*** (6.83)	0.267*** (5.52)	0.257*** (5.31)
Equity Income	-7.254*** (-11.38)	-7.244*** (-11.38)	-6.547*** (-9.30)	-6.535*** (-9.29)
Size	0.007*** (6.03)	0.007*** (5.88)	0.009*** (7.53)	0.008*** (7.36)
MB	-0.002 (-1.05)	-0.002 (-1.33)	-0.006*** (-3.31)	-0.006*** (-3.67)
cons	0.337*** (8.24)	0.345*** (8.40)	0.304*** (7.85)	0.312*** (8.05)
Year dummy	yes	yes	yes	yes
industry dummy	yes	yes	yes	yes
N	24210	24210	24210	24210
ADJ. R2	0.095	0.096	0.098	0.098

Notes: (29) and (30) show OLS results on Gaap ETR3 as a dependent variable. (31) and (32) show OLS results on Current ETR3 as a dependent variable also. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-value stands for White's robust t-value.

Table 12 Effect of outside director for long term tax avoidance of overconfident CEO

	Gaap_ETR5		Current_ETR5	
	(33)	(34)	(35)	(36)
OC Firm4	-0.004 (-1.11)		0.001 (0.36)	
Firm4 *High ID	0.002 (0.38)		-0.001 (-0.18)	
OC Firm5		-0.013*** (-3.44)		-0.010** (-2.51)
Firm5 *High ID		0.007 (1.03)		-0.000 (-0.04)
High ID	-0.014*** (-3.36)	-0.017*** (-3.95)	-0.014*** (-3.21)	-0.015*** (-3.34)
CFO	0.216*** (6.90)	0.212*** (6.80)	0.162*** (4.96)	0.157*** (4.83)
Leverage	-0.014 (-1.09)	-0.004 (-0.30)	-0.018 (-1.32)	-0.002 (-0.20)
NOL	-0.598*** (-18.93)	-0.591*** (-18.66)	-0.640*** (-18.78)	-0.631*** (-18.46)
ΔNOL	-0.074 (-1.44)	-0.075 (-1.45)	-0.095 (-1.41)	-0.097 (-1.43)
Foreign Sales Ratio	-0.043*** (-4.40)	-0.044*** (-4.47)	-0.051*** (-4.97)	-0.052*** (-5.04)
PPE	-0.037*** (-3.05)	-0.037*** (-3.01)	-0.046*** (-3.71)	-0.046*** (-3.64)
Intangible	0.245*** (4.63)	0.240*** (4.53)	0.209*** (3.77)	0.199*** (3.60)
Equity Income	-5.466*** (-6.69)	-5.456*** (-6.68)	-5.158*** (-6.06)	-5.146*** (-6.05)
Size	0.005*** (4.27)	0.005*** (4.17)	0.007*** (5.67)	0.007*** (5.55)
MB	0.002 (1.14)	0.002 (0.97)	-0.003 (-1.19)	-0.0033 (-1.48)
cons	0.356*** (21.59)	0.362*** (21.89)	0.367*** (21.48)	0.373*** (21.84)
Year dummy	yes	yes	yes	yes
industry dummy	yes	yes	yes	yes
N	18109	18109	18109	18109
ADJ. R2	0.083	0.084	0.087	0.087

Notes: (33) and (34) show OLS results on Gaap ETR5 as a dependent variable. (35) and (36) show OLS results on Current ETR5 as a dependent variable as . Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively. This t-values stands for White's robust t-value.

4.3 Effect on Tax Avoidance by Overconfident Managers

According to Tax Avoidance Condition

This section verifies Hypothesis 3 by 25 percentile-segmented quantile regression, using the same variables as the regression model employed in Hypothesis 1. Table 13 presents *Gaap_ETR* as a dependent variable. Analysis taking OC Firm4 as an independent variable shows OC Firm4 coefficients (t-values) for the 25th, 50th, and 75th percentile as -0.016 (-5.84), -0.008 (-4.81), and -0.002 (-1.06), respectively. While these t-values are not significant for analysis of the 75th percentile, they have a 1% significance for the other percentiles. Analysis taking OC Firm5 as an independent variable displays OC Firm5 coefficients (t-values) for the 25th, 50th, and 75th percentile as -0.028 (-11.68), -0.015 (-7.76), and -0.006 (-3.12), respectively. These t-values have 1% significance for all percentiles.

Table 14 presents research taking *Current_ETR* as a dependent variable. Taking OC Firm4 as an independent variable displays coefficients (t-values) for the 25th, 50th and 75th percentile of -0.014 (-5.18), -0.003 (-2.74) and -0.006 (-3.55), respectively. These t-values have 1% significance for all percentiles. Taking OC Firm5 as an independent variable has OC Firm5 coefficients (t-values) for the 25th, 50th and 75th percentile of -0.030 (-10.13), -0.008 (-7.24) and -0.002 (1.13), respectively. These t-values are 1% for each percentile, except for the 75th percentile where analytical results are not significant.

The results of Tables 13 and 14, since they have significance also for the smallest coefficient for the 25th percentile, support Hypothesis 3. In sum, these results suggest that the effect on tax avoidance of overconfident managers with risk preference characteristics strengthens to the degree that businesses undertake high-risk, aggressive tax avoidance as a tax policy. For businesses in the 75th percentile for which ETR shows non-aggressive tax avoidance, the trend toward aggressive tax avoidance is weaker than the ETR indicates for businesses included in the 25th percentile.

Tables 15 and 16 display empirical results where the 1-year ETR of Tables 13 and 14 is extended to 3 years. Table 15 presents analysis taking *Gaap_ETR3* as a dependent variable. Analysis taking OC Firm4 as an independent

Table 13 Quantile regression analysis

percentile	Gaap_ETR					
	(36) 25%	(37) 50%	(38) 75%	(39) 25%	(40) 50%	(41) 75%
OC Firm4	-0.016*** (-5.84)	-0.008*** (-4.81)	-0.002 (-1.06)			
OC Firm5				-0.028*** (-11.68)	-0.015*** (-7.76)	-0.006*** (-3.12)
CFO	0.573*** (24.56)	0.297*** (18.07)	0.0314 (1.62)	0.557*** (25.57)	0.291*** (17.77)	0.0241 (1.27)
Leverage	-0.243*** (-25.79)	-0.0964*** (-11.53)	0.0397*** (4.93)	-0.228*** (-24.70)	-0.0906*** (-11.23)	0.0451*** (5.68)
NOL	-0.992*** (-97.88)	-0.914*** (-26.67)	-0.622*** (-19.29)	-0.963*** (-77.82)	-0.903*** (-28.67)	-0.620*** (-20.60)
ΔNOL	-0.152 (-1.31)	-0.193*** (-4.30)	0.0364 (0.36)	-0.172** (-1.98)	-0.191*** (-2.79)	0.0372*** (7.93)
Foreign Sales Ratio	-0.030*** (-5.05)	-0.065** (-18.99)	-0.062*** (-12.59)	-0.030*** (-5.38)	-0.062*** (-17.23)	-0.062*** (-12.25)
PPE	-0.032*** (-3.28)	-0.028*** (-4.90)	-0.017*** (-2.67)	-0.025*** (-2.77)	-0.028*** (-4.93)	-0.017*** (-2.73)
Intangible	0.098** (2.37)	0.245*** (11.44)	0.468*** (10.95)	0.0891** (2.08)	0.237*** (10.89)	0.466*** (11.03)
Equity Income	-2.139*** (-5.92)	-6.049*** (-22.95)	-6.916*** (-23.99)	-1.974*** (-7.01)	-6.031*** (-22.53)	-6.859*** (-25.85)
Size	0.014*** (16.59)	0.004*** (8.31)	-0.003*** (-4.91)	0.013*** (16.33)	0.003*** (6.84)	-0.003*** (-5.37)
MB	0.003*** (3.41)	-0.003*** (-5.28)	-0.008*** (-11.00)	0.003*** (4.31)	-0.003*** (-5.19)	-0.008*** (-11.06)
cons	0.133*** (12.45)	0.318*** (54.71)	0.447*** (61.89)	0.144*** (13.59)	0.324*** (56.52)	0.452*** (60.99)
Year dummy	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes
N	27934	27934	27934	27934	27934	27934
ADJ. R2	0.1855	0.1097	0.0702	0.1867	0.1103	0.0703

Notes : Table 13 presents the result of quantile regression analysis using Gaap ETR as a dependent variable. From (36) to (38) show the result of quantile regression analysis using OC Firm4 as an independent variable and from (39) to (41) show the result of quantile regression analysis using OC Firm5 as an independent variable. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively.

Table 14 Quantile regression analysis

percentile	Current_ETR					
	(42) 25%	(43) 50%	(44) 75%	(45) 25%	(46) 50%	(47) 75%
OC Firm4	-0.014*** (-5.18)	-0.003*** (-2.74)	0.006*** (3.55)			
OC Firm5				-0.030*** (-10.13)	-0.008*** (-7.24)	0.002 (1.13)
CFO	0.403*** (16.32)	0.0738*** (6.44)	-0.126*** (-7.53)	0.397*** (18.6)	0.0764*** (6.85)	-0.129*** (-8.20)
Leverage	-0.238*** (-22.05)	-0.034*** (-6.07)	0.073*** (9.54)	-0.215*** (-21.20)	-0.029*** (-5.44)	0.079*** (10.59)
NOL	-1.453*** (-120.04)	-1.039*** (-22.59)	-0.610*** (-23.59)	-1.407*** (-125.76)	-1.030*** (-22.05)	-0.609*** (-25.34)
ΔNOL	-0.159** (-2.28)	-0.250*** (-5.73)	-0.0105 (-0.10)	-0.155** (-2.17)	-0.254*** (-2.72)	-0.0187 (-0.30)
Foreign Sales Ratio	-0.073*** (-13.30)	-0.076*** (-27.48)	-0.052*** (-15.52)	-0.075*** (-12.80)	-0.077*** (-27.36)	-0.052*** (-12.38)
PPE	-0.023** (-2.54)	-0.016*** (-4.18)	-0.019*** (-3.38)	-0.025** (-2.54)	-0.016*** (-4.76)	-0.018*** (-3.12)
Intangible	0.0975*** (3.21)	0.252*** (11.03)	0.463*** (13.29)	0.0858*** (2.75)	0.251*** (11.18)	0.459*** (13.34)
Equity Income	-3.383*** (-7.58)	-5.567*** (-22.48)	-6.711*** (-19.30)	-3.148*** (-7.61)	-5.493*** (-21.80)	-6.647*** (-31.30)
Size	0.013*** (17.39)	0.002*** (5.38)	-0.003*** (-6.06)	0.013*** (16.56)	0.002*** (5.95)	-0.003*** (-5.53)
MB	-0.002*** (-2.84)	-0.006*** (-16.23)	-0.010*** (-20.45)	-0.003*** (-4.18)	-0.006*** (-14.04)	-0.010*** (-16.39)
cons	0.160*** (16.91)	0.333*** (70.68)	0.432*** (69.84)	0.169*** (16.83)	0.336*** (81.65)	0.431*** (67.78)
Year dummy	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes
N	27934	27934	27934	27934	27934	27934
ADJ. R2	0.1933	0.1175	0.0763	0.1947	0.1178	0.0761

Notes : Table 14 presents the result of quantile regression analysis using Gaap ETR as a dependent variable. From (42) to (44) show the result of quantile regression analysis using OC Firm4 as an independent variable and from (45) to (47) show the result of quantile regression analysis using OC Firm5 as an independent variable. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively.

Table 15 Quantile regression analysis

percentile	Gaap_ETR3					
	(48) 25%	(49) 50%	(50) 75%	(51) 25%	(52) 50%	(53) 75%
OC Firm4	-0.010*** (-4.08)	-0.003** (-2.00)	0.005*** (2.78)			
OC Firm5				-0.018*** (-8.15)	-0.008*** (-6.04)	0.002 (1.01)
CFO	0.536*** (24.13)	0.144*** (10.34)	-0.0904*** (-5.10)	0.540*** (27.22)	0.146*** (10.92)	-0.0895*** (-5.06)
Leverage	-0.208*** (-21.22)	-0.052*** (-8.04)	0.054*** (6.69)	-0.193*** (-20.44)	-0.043*** (-6.52)	0.059*** (7.1)
NOL	-1.252*** (-86.94)	-0.951*** (-24.77)	-0.595*** (-22.12)	-1.224*** (-117.16)	-0.939*** (-24.39)	-0.593*** (-21.58)
ΔNOL	-0.122** (-2.23)	-0.0752 (-1.31)	0.104 (1.28)	-0.128** (-2.14)	-0.0789 (-0.87)	0.104 (1.15)
Foreign Sales Ratio	-0.060*** (-14.90)	-0.061*** (-18.83)	-0.042*** (-8.52)	-0.061*** (-12.79)	-0.061*** (-19.93)	-0.042*** (-7.82)
PPE	-0.026*** (-3.35)	-0.022*** (-4.85)	-0.001 (-0.22)	-0.026*** (-3.08)	-0.022*** (-4.67)	-0.002 (-0.37)
Intangible	0.177*** (4.2)	0.315*** (11.24)	0.581*** (14.02)	0.172*** (4.7)	0.313*** (10.72)	0.576*** (13.32)
Equity Income	-3.970*** (-11.98)	-5.997*** (-18.79)	-7.071*** (-26.83)	-4.133*** (-12.60)	-5.874*** (-20.71)	-7.037*** (-25.07)
Size	0.010*** (14.00)	-0.001 (-1.18)	-0.004*** (-7.62)	0.010*** (15.04)	-0.001 (-1.47)	-0.005*** (-6.92)
MB	0.002** (2.29)	-0.002*** (-3.68)	-0.006*** (-6.89)	0.001 (1.33)	-0.002*** (-3.69)	-0.006*** (-7.46)
cons	0.213*** (17.43)	0.365*** (12.26)	0.499*** (24.69)	0.212*** (25.96)	0.369*** (49.09)	0.502*** (16.69)
Year dummy	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes
N	24237	24237	24237	24237	24237	24237
ADJ. R2	0.178	0.1076	0.0806	0.1787	0.1079	0.0805

Notes: Table 15 presents the result of quantile regression analysis using Gaap ETR3 as a dependent variable. (48) to (50) show the result of quantile regression analysis using OC Firm4 as an independent variable and (51) to (53) show the result of quantile regression analysis using OC Firm5 as an independent variable. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively.

variable has 1% and 5% significance for the 25th and 50th percentiles, respectively, while a negative effect is seen for both, and 1% significance and a positive effect is evident for the 75th percentile. While analysis taking OC Firm5 as an independent variable is seen to have 1% significance and a negative effect for both 25th and 50th percentiles, significant results are not evident for the 75th percentile.

Table 16 presents research taking Current ETR3 as a dependent variable. Analysis taking OC Firm4 as an independent variable has 1% significance and a negative effect for the 25th percentile ; no significance, but a negative effect evident for the 50th percentile, and 1% significance and a positive effect for the 75th percentile. Taking OC Firm5 as an independent variable, 1 % significance and a negative effect are seen for percentiles other than the 75th.

For results using 3-year ETR, the ETR denoting aggressive tax avoidance behaviors show a stronger influence on aggressive tax avoidance by overconfident managers in businesses in the 25th percentile than those in the other percentiles. Moreover, the non-aggressive tax avoidance ETR show that businesses in the 75th percentile feature a smaller influence on tax avoidance by overconfident managers than that in the other percentiles.

Finally, tables 17 and 18 display empirical results where the 1-year ETR of Tables 13 and 14 is extended to 5 years. Table 17 presents analysis taking Gaap ETR5 as a dependent variable. Taking OC Firm4 as an independent variable does not yield significant results for the 25th or 75th percentile. A 10 % significance and a negative effect are evident in analysis of the 50th percentile. While significant results are not obtained for the 75th percentile with analysis using OC Firm5 as an independent variable, 1% significance and a negative effect are seen for the other percentiles.

Table 16 Quantile regression analysis

percentile	Current_ETR3					
	(54) 25%	(55) 50%	(56) 75%	(57) 25%	(58) 50%	(59) 75%
OC Firm4	-0.009*** (-3.46)	-0.0011 (-0.81)	0.006*** (3.10)			
OC Firm5				-0.021*** (-7.80)	-0.006*** (-5.34)	0.003 (1.45)
CFO	0.427*** (18.36)	0.066*** (6.74)	-0.148*** (-8.81)	0.422*** (22.25)	0.063*** (6.06)	-0.146*** (-8.24)
Leverage	-0.205*** (-17.80)	-0.014*** (-2.81)	0.090*** (9.78)	-0.191*** (-17.48)	-0.008 (-1.62)	0.095*** (11.07)
NOL	-1.543*** (-103.34)	-0.983*** (-21.23)	-0.574*** (-16.61)	-1.506*** (-86.19)	-0.980*** (-20.78)	-0.571*** (-16.29)
ΔNOL	-0.246*** (-7.80)	-0.160*** (-4.54)	0.0965 (0.91)	-0.253*** (-3.22)	-0.171* (-1.83)	0.101 (1.15)
Foreign Sales Ratio	-0.080*** (-14.23)	-0.069*** (-20.54)	-0.049*** (-10.78)	-0.079*** (-14.85)	-0.068*** (-22.48)	-0.050*** (-12.34)
PPE	-0.018* (-1.91)	-0.019*** (-5.60)	-0.021*** (-3.49)	-0.017** (-2.10)	-0.018*** (-5.13)	-0.021*** (-3.50)
Intangible	0.152*** (6.11)	0.271*** (13.00)	0.441*** (11.52)	0.147*** (5.74)	0.260*** (13.90)	0.433*** (10.77)
Equity Income	-3.986*** (-12.26)	-5.280*** (-15.57)	-6.232*** (-19.31)	-4.025*** (-9.47)	-5.339*** (-17.07)	-6.141*** (-20.85)
Size	0.011*** (13.57)	0.000 (1.30)	-0.004*** (-6.59)	0.011*** (16.09)	0.000 (1.08)	-0.004*** (-7.08)
MB	-0.001 (-0.71)	-0.005*** (-16.12)	-0.009*** (-11.22)	-0.001 (-1.22)	-0.005*** (-12.27)	-0.009*** (-11.16)
cons	0.204*** (18.19)	0.367*** (35.96)	0.463*** (21.86)	0.206*** (8.97)	0.366*** (17.48)	0.457*** (16.26)
Year dummy	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes
N	24237	24237	24237	24237	24237	24237
ADJ. R2	0.1868	0.1172	0.078	0.1877	0.1174	0.0779

Notes: Table 16 presents the result of quantile regression analysis using Current ETR3 as a dependent variable. From (54) to (56) show the result of quantile regression analysis using OC Firm4 as an independent variable and from (57) to (59) show the result of quantile regression analysis using OC Firm5 as an independent variable. Definitions of variables are based on those found in Appendix A Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively.

Table 17 Quantile regression analysis

percentile	Gaap_ETR5					
	(60) 25%	(61) 50%	(62) 75%	(63) 25%	(64) 50%	(65) 75%
OC Firm4	-0.003 (-1.44)	-0.002* (-1.69)	0.004 (1.64)			
OC Firm5				-0.011*** (-5.48)	-0.007*** (-5.31)	0.001 (0.49)
CFO	0.379*** (17.08)	0.0683*** (5.05)	-0.140*** (-6.74)	0.380*** (15.72)	0.0710*** (5.54)	-0.142*** (-7.16)
Leverage	-0.139*** (-11.88)	-0.019*** (-3.14)	0.080*** (8.21)	-0.126*** (-10.83)	-0.013*** (-2.07)	0.085*** (8.78)
NOL	-1.378*** (-28.38)	-0.884*** (-18.88)	-0.561*** (-15.85)	-1.362*** (-26.52)	-0.879*** (-17.90)	-0.562*** (-15.41)
ΔNOL	-0.066 (-0.38)	-0.010 (-0.07)	0.023 (0.16)	-0.059 (-0.35)	-0.011 (-0.07)	0.023 (0.15)
Foreign Sales Ratio	-0.072*** (-13.89)	-0.062*** (-22.94)	-0.044*** (-6.28)	-0.072*** (-14.25)	-0.062*** (-20.43)	-0.044*** (-6.68)
PPE	-0.037*** (-4.54)	-0.016*** (-3.22)	-0.010 (-1.37)	-0.036*** (-4.25)	-0.015*** (-3.63)	-0.010 (-1.58)
Intangible	0.144*** (3.99)	0.302*** (12.3)	0.474*** (9.00)	0.135*** (3.01)	0.290*** (12.71)	0.470*** (8.7)
Equity Income	-4.474*** (-10.72)	-5.243*** (-19.49)	-5.896*** (-13.14)	-4.558*** (-17.20)	-5.286*** (-22.51)	-6.017*** (-13.24)
Size	0.0056*** (8.32)	-0.002*** (-5.48)	-0.006*** (-7.38)	0.005*** (7.29)	-0.002*** (-5.88)	-0.006*** (-7.56)
MB	0.006*** (4.90)	0.000 (0.81)	-0.003*** (-3.03)	0.005*** (5.10)	0.000 (0.02)	-0.003*** (-2.86)
cons	0.236*** (7.30)	0.378*** (13.48)	0.491*** (12.87)	0.241*** (4.60)	0.379*** (12.97)	0.492*** (16.65)
Year dummy	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes
N	18109	18109	18109	18109	18109	18109
ADJ. R2	0.1553	0.1052	0.0803	0.1558	0.1055	0.0802

Notes: Table 17 presents the result of quantile regression analysis using Gaap ETR5 as a dependent variable. From (60) to (62) show the result of quantile regression analysis using OC Firm4 as an independent variable and from (63) to (65) show the result of quantile regression analysis using OC Firm5 as an independent variable. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively.

Table 18 Quantile regression analysis

percentile	Current_ETR5					
	(66)	(67)	(68)	(69)	(70)	(71)
	25%	50%	75%	25%	50%	75%
OC Firm4	-0.002 (-0.86)	0.001 (0.84)	0.008*** (3.20)			
OC Firm5				-0.011*** (-5.18)	-0.003*** (-3.02)	0.004* (1.90)
CFO	0.308*** (13.63)	0.004 (0.33)	-0.198*** (-8.96)	0.307*** (14.68)	0.003 (0.34)	-0.196*** (-9.44)
Leverage	-0.129*** (-11.54)	0.003 (0.57)	0.107*** (11.04)	-0.119*** (-10.47)	0.009* (1.82)	0.112*** (11.33)
NOL	-1.634*** (-92.90)	-0.923*** (-19.85)	-0.562*** (-15.00)	-1.597*** (-57.57)	-0.914*** (-19.35)	-0.563*** (-15.35)
ΔNOL	-0.207** (-2.11)	-0.118* (-1.66)	0.0277 (0.32)	-0.235*** (-4.09)	-0.119** (-2.22)	0.0271 (0.24)
Foreign Sales Ratio	-0.082*** (-21.38)	-0.073*** (-23.02)	-0.039*** (-6.04)	-0.082*** (-16.21)	-0.072*** (-22.83)	-0.039*** (-6.38)
PPE	-0.0443*** (-5.75)	-0.0278*** (-7.38)	-0.0325*** (-4.55)	-0.0440*** (-5.63)	-0.0267*** (-7.30)	-0.0311*** (-4.41)
Intangible	0.112*** (2.83)	0.234*** (14.07)	0.364*** (8.61)	0.100** (2.21)	0.226*** (21.39)	0.360*** (7.90)
Equity Income	-3.695*** (-11.31)	-4.941*** (-18.55)	-5.968*** (-14.43)	-3.817*** (-9.98)	-4.895*** (-22.93)	-5.992*** (-20.44)
Size	0.006*** (8.00)	-0.001* (-1.78)	-0.005*** (-6.37)	0.006*** (8.00)	-0.001* (-1.96)	-0.005*** (-6.87)
MB	0.002 (1.50)	-0.003*** (-6.03)	-0.008*** (-7.45)	0.001 (1.28)	-0.003*** (-6.01)	-0.008*** (-10.63)
cons	0.271*** (13.87)	0.379*** (47.74)	0.477*** (18.29)	0.275*** (8.31)	0.382*** (33.27)	0.482*** (14.79)
Year dummy	yes	yes	yes	yes	yes	yes
Industry dummy	yes	yes	yes	yes	yes	yes
N	18109	18109	18109	18109	18109	18109
ADJ. R2	0.1699	0.1124	0.0755	0.1704	0.1125	0.0753

Notes: Table 18 presents the result of quantile regression analysis using Current ETR5 as a dependent variable. From (66) to (68) show the result of quantile regression analysis using OC Firm4 as an independent variable and from (69) to (71) show the result of quantile regression analysis using OC Firm5 as an independent variable. Definitions of variables are based on those found in Appendix A. Robust standard errors are reported in parentheses. ***, **, and * indicate 0.01, 0.05, and 0.10 significance levels, respectively.

Table 18 presents analysis taking Current ETR5 as a dependent variable. Taking OC Firm4 as an independent variable showed 1% significance and a positive effect for the 75th percentile, with no significant results for the other percentiles. While taking OC Firm5 as an independent variable was seen to have 1% significance and a positive effect for the 75th percentile, 1% significance and a negative effect was evident for the other percentiles. For analysis using 5-year ETR in tax avoidance indices, while OC Firm4 did not show constant results, analysis using OC Firm5 showed similar trends in both 1- and 3-year ETR cases.

5 Additional Analysis

We additionally conduct two types of analysis related to robustness. The first examines differences before and after changeover of management. This study's analytical method is the possible establishment of relatedness, in contrast to Hypothesis 1, between appointment of overconfident managers and businesses aggressively engaged in tax avoidance. This analysis, focusing on managerial changeover, verifies whether tax avoidance efforts become more aggressive following appointment of overconfident managers. The analytical method consists of using variables derived from the difference between periods t and $t-1$ for each of the *ETR*, *OC*, and control variables of the above equation (1). The analyzed samples target only the accounting period in which the managerial changeover occurred. For this additional analysis, it is predicted that, where overconfident managers have been appointed due to managerial change, the degree of tax avoidance would increase, with coefficients assuming negative values. Significant results are not obtained, and the hypothesis is not supported (untabulated).

The second type of analysis adds businesses' fixed effects. Dyreng et al. (2010) have demonstrated the influence of individual managers on tax avoidance behaviors through assuming fixed managerial effects. When assuming these effects, Dyreng et al. (2010) have controlled corporate fixed effects and separated managerial and corporate influence on tax avoidance in their analysis.

Their study also, while controlling company-specific characteristics for

Hypothesis 1 analysis, has probably not sufficiently controlled influence by individual companies. In particular, specific corporate influence is probably endogenously present within variables related to overconfident managers, because they have been prepared from company-specific investment and fundraising behaviors. For this reason, we conduct empirical research with corporate fixed effects controlled for the above equation (1). Empirical results were unchanged from the results in Tables 4 to 6.

6 Conclusion

Our study investigates the overconfidence, tax aggressiveness, and financial reporting literatures by examining the role of overconfident management in corporate tax policy. Using management overconfidence measures based on both OC Firm4 and OC Firm5 from Schrand and Zechman (2012), we initially develop multiple measures of tax aggressiveness, for which we document consistently positive and statistically significant relations between management overconfidence and tax aggressiveness. To build upon these prior findings, we examine for associations between overconfidence for managers and degree of tax avoidance, using quantile regression analysis. This second set of tests gives us some insight about managers' own valuations of the likelihood of aggressive tax positions. Consistent with our hypothesis, this relation is negative and significant.

Hence, it seems that firms with overconfident managers are inclined to implement more aggressive on tax avoidance. Moreover, firms with overconfident managers estimate and disclose that more of the tax avoidance they implement will be successfully supported. The asymmetric outcome in findings from our research is relevant for regulators, policymakers, capital market participants, and other academics who have studied tax aggressiveness and managerial overconfidence. We believe these findings contribute to the existing literature on this subject.

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Appendix A : Variable Definitions

Variables	Definitions
Effective tax rate (ETR)	
Gaap_ETR	Total tax expense scaled by total pre-tax income minus total special items for one year.
Current_ETR	Total taxes paid in cash and cash equivalent scaled by total pre-tax income minus total special items for one year.
Gaap_ETR3 (5)	Total tax expense over the last three (five) years scaled by total pre-tax income minus total special items over the same period.
Current_ETR3 (5)	Total taxes paid in cash and cash equivalent over the last three (five) years scaled by total pre-tax income minus total special items over the same period of time.
OC valuables	
Firm4	1 if firm meets the requirement of at least 2 of 4 criteria following, 0 otherwise (1) X_Invest_INDADJ is greater than 0, (2) Intangible_INDADJ is greater than 0, (3) DE_Ratio_INDADJ is greater than 0 and (4) Risky_debt is one.
Firm5	1 if firm meets the requirement of at least 3 of 5 criteria following, 0 otherwise (1) X_Invest_INDADJ is greater than 0, (2) Intangible_INDADJ is greater than 0, (3) DE_Ratio_INDADJ is greater than 0, (4) Risky_debt is one and (5) DIVYLD is zero.
(1) X Invest INDADJ	Residual from a regression of total asset growth on sales growth, adjusted for the industry median.
(2) Intangible INDADJ	Purchase cost of intangible assets from cash flow statement adjusted for the industry median.
(3) DE Ratio INDADJ	DE Ratio is total debt divided by equity. Total debt is included in short term debt and long-term debt. equity is sum of market-value of equity and long-term debt. DE Ratio INDADJ is DE Ratio adjusted for the industry median.
(4) Risky debt	1 if either convertible debt or preferred stock is greater than zero, 0 otherwise.
(5) DIVYLD	Dividend yield, equal to dividends per share divided by share price for the firms that pay dividends.

Control valuables	
CFO	Cash flow from operation scaled by total assets.
Leverage	Total debt including short term and debt long term debt divided by total assets.
NOL	Loss carried forward divided by total assets (if Loss carried forward is zero, NOL is zero).
Δ NOL	Loss carried forward minus loss carry forward in the prior year divided by total assets.
Foreign Sales Ratio	Foreign sales divided by sales (if foreign sales is zero, Foreign Sales Ratio is zero).
PPE	Tangible assets divided by total assets.
Intangible	Intangible assets divided by total assets.
Equity Income	Equity income divided by total assets (if equity income is zero, Equity Income is zero).
Size	Logarithm of total assets.
MB	Market-value of equity divided by book value of equity.
Strong Monitor	
High INST	1 if percent of share held by institutional investor is more than median of the percent of share in this sample, 0 otherwise.
High ID	1 if percent of board director held by outside director is more than median of the percent of board director in this sample, 0 otherwise.