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The Influence of Senior Executive Compensation on Corporate Tax Avoidance of European Publicly Listed Firms

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Abstract

This study investigates the influence of total senior executive compensation on corporate tax avoidance of European publicly listed firms. This study hypothesizes that total senior executive compensation positively (negatively) influences corporate tax avoidance when the marginal net benefits of corporate tax avoidance are positive (negative). Besides, this study hypothesizes that the proportion of strictly independent board members strengthens both the positive and negative relationship between total senior executive compensation and corporate tax avoidance. The panel data consists of 387 European publicly listed firms and 15 years from 2007 to 2021. In the main analysis, four different panel-corrected standard error (PCSE) models are used to estimate the impact of total senior executive compensation on corporate tax avoidance. These four models use different measures of corporate tax avoidance. The PCSE models control for the effect of the proportion of strictly independent board members, firm size, leverage, profitability, new investments made, firm fixed effects, and industry-year fixed effects. Focusing on the PCSE model with the most accurate measure of corporate tax avoidance (the residual book-tax-gap), the results indicate that all hypotheses are supported. Therefore, this study provides evidence for the rationale that corporate governance mechanisms alleviate agency problems at relatively low and high levels of corporate tax avoidance activity. Two different robustness checks lead to the same conclusion. Besides, the study's limitations are discussed and suggestions for future research are provided.

Keywords: Corporate tax avoidance; Total senior executive compensation; Strictly independent board members; Corporate governance.

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1. Introduction

Corporate taxes are mandatory contributions that firms must pay to the government (Ansar et al., 2021). The government uses tax inflows to finance public goods and foster national economic growth. On the other hand, these corporate taxes are expenses that lower the net income of firms. This may lead to the phenomena called corporate tax avoidance: firms engage in tax planning activities to lower taxes paid in a legal way and consequently increase after-tax income (Semaan, 2017). The decision to engage in corporate tax avoidance – and to what extent – is made by senior executives, which are managers at the top of the organization who are responsible for planning, controlling, and leading the day-to-day operations (Desai & Dharmapala, 2006). Managers are often incentivized to act in the best interest of the shareholders, because shareholders cannot fully monitor managerial decision making. Commonly, managers are incentivized via monetary compensation (Schleifer & Vishny, 1997). The aim of this study is to investigate the influence of total senior executive compensation on corporate tax avoidance of European publicly listed firms and the extent to which this relationship is moderated by the proportion of strictly independent board members.

1.1. Research Problem & Motivation

While recent studies have researched the influence of senior executive compensation components on corporate tax avoidance, research has not investigated the effect of total senior executive compensation on corporate tax avoidance for European publicly listed firms (Ansar et al., 2021; Desai & Dharmapala, 2006; Wang et al., 2020; Wang & Yao, 2021). In addition, studies about the influence of senior executive compensation on corporate tax avoidance provide mixed evidence. Wang & Yao (2021), using a sample of Chinese publicly listed firms, find that total compensation of the top three executives with the highest compensation does not influence corporate tax avoidance of non-state-owned firms. However, a significant positive effect is found for state-owned firms. On the contrary, Desai & Dharmapala (2006) find that the ratio of stock options granted to total compensation for the top five executives negatively influences corporate tax avoidance. Armstrong et al. (2015) only research the influence of CEO equity incentives on corporate tax avoidance and find a positive relationship.

On top of empirically contradicting results, theories contradict each other about the possible effect of total senior executive compensation on corporate tax avoidance. Agency theory predicts that compensation incentives lead to better alignment of managers' and shareholders' goals (Schleifer & Vishny, 1997). This means that managers have more

incentives to increase net income and therefore increase tax avoidance when their compensation depends on net income. Examples of variable compensation are bonusses, stocks granted, and options granted (Fahlenbrach & Stulz, 2011). Besides, managers have more incentives to increase net income and consequently tax avoidance when their fixed compensation (salary) is sufficiently large compared to competitors, because the pain from potential dismissal when income is low is too large (Fahlenbrach & Stulz, 2011; Jensen & Meckling, 1976; Schleifer & Vishny, 1997). On the other hand, agency theory also suggests that increasing compensation for senior executives could lead to less corporate tax avoidance, because corporate tax avoidance can be seen as a value destroyer for shareholders. Corporate tax avoidance reduces shareholder value when the related expenses to corporate tax avoidance strategies – i.e., reputational consequences of negative media coverage, tax consultant fees, and risk of accidentally engaging in tax evasion and subsequently being penalized by tax authorities – outweigh the benefits of lower tax expenses through corporate tax avoidance (Semaan, 2017). All in all, literature does not predict the same relationship between total senior executive compensation and corporate tax avoidance. Consequently, this study aims to examine the influence of total compensation provided to senior executives on corporate tax avoidance of European publicly listed firms.

This study is academically relevant, because research has not investigated the effect of total senior executive compensation on corporate tax avoidance for European publicly listed firms (Ansar et al., 2021; Armstrong et al., 2012; Armstrong et al., 2015; Desai & Dharmapala, 2006; Wang et al., 2020; Wang & Yao, 2021). Research related to the effect of executive compensation on corporate tax avoidance is namely mostly based on data from the United States, making it hard to generalize the findings to European countries with different institutional backgrounds and corporate governance regimes that influence corporate outcomes such as tax avoidance (La porta et al., 2000; Wang et al., 2020). Besides, several new measures of corporate tax avoidance have been introduced in the literature, giving the opportunity to provide a better estimate of the effect of corporate governance mechanisms on corporate tax avoidance. Furthermore, which has been stated before, economic theory predicts different signs of the relationship and research has provided mixed evidence. Thus, this study fills a gap in the literature about the influence of total senior executive compensation on corporate tax avoidance by examining the relationship for European publicly listed firms. Besides, research has mostly focused on the effect of awarded stocks and stock options on corporate tax avoidance (Armstrong et al., 2015; Desai & Dharmapala, 2006). Therefore, this study fills a gap in the literature by investigating the effect of all compensation components of senior executive

compensation together – i.e., bonusses, salary, stocks awarded, options awarded, and long-term incentive plan awards – on corporate tax avoidance of European publicly listed firms in a single analysis.

This study has societal relevance, because corporate tax avoidance is gaining more and more attention in the media. Besides, it is relevant for society to study corporate tax avoidance because corporate tax avoidance ultimately increases the burden of taxpayers (Semaan, 2017). It is also relevant to study the influence of senior executive compensation on corporate tax avoidance because increased corporate tax avoidance is likely to lead to lower stock prices (Hanlon & Slemrod, 2009; O'Donovan et al., 2019), leading to negative returns for investors. Moreover, it is relevant for the accounting and auditing practice to study the influence of senior executive compensation on corporate tax avoidance because the study's results may inform whether the level of senior executive compensation should be decreased or increased to increase corporate tax avoidance. Donohoe & Knechel (2014) namely found that corporate tax avoidance is positively related with audit fees, possibly due to increased reputational risk of auditors when corporate tax avoidance is relatively high. On top of that, the results of the study may provide tax authorities with possible indicators of strong corporate tax avoidance activity, improving monitoring of firm behavior.

Besides the effect of total senior executive compensation on corporate tax avoidance, this study investigates whether the relationship between total senior executive compensation and corporate tax avoidance is moderated by the proportion of board members that provide strictly independent board services. These board members monitor senior executives and provide incentives to senior executives to act in shareholders' interest. It is academically relevant to investigate whether the relation between total senior executive compensation and corporate tax avoidance depends on the proportion of strictly independent board members, because the moderating effect of this structural corporate governance variable has not been researched before. Armstrong et al. (2015) namely only researched the direct effect of board independence, measured as the proportion of independent directors, on corporate tax avoidance. It is socially relevant to investigate this moderating effect because a significant interaction effect informs society whether corporate governance mechanisms (specifically strictly independent board members) are effective in influencing the relation between other corporate governance mechanisms (senior executive compensation) and corporate outcomes (tax avoidance).

1.2. Research Objectives

Based on mixed evidence provided by the literature, the first objective of this study is to reexamine the relationship between total senior executive compensation and corporate tax avoidance by providing evidence that reconciles the existence of positive and negative effects found in earlier studies. This results in the following research question:

What is the influence of total senior executive compensation on corporate tax avoidance of European publicly listed firms?

The answer to the research question is provided by investigating the relationship between total senior executive compensation and tax avoidance of European publicly listed firms across the tax avoidance distribution. More concrete, the relationship is investigated for firm-years in which corporate tax avoidance has a low, medium, and high level. In this way, it is possible to investigate whether the effect of total senior executive compensation on corporate tax avoidance depends on the level of corporate tax avoidance. Armstrong et al. (2015) namely state that the influence of corporate governance mechanisms on corporate tax avoidance depends on the level of corporate tax avoidance, because the marginal net benefits of corporate tax avoidance differ dependent on the level of corporate tax avoidance. Consequently, the study's results may reconcile the coexistence of positive and negative effects of total senior executive compensation on corporate tax avoidance found in earlier studies by investigating the relationship for different levels of corporate tax avoidance.

Given the lack of consensus in the literature about the influence of total senior executive compensation on corporate tax avoidance and the nonexistent literature about the moderating role of board independence, the second objective of this study is to obtain knowledge about the way in which the proportion of strictly independent board members influences the relationship between total senior executive compensation and corporate tax avoidance. This results in the following sub question:

What is the influence of the proportion of strictly independent board members on the relation between total senior executive compensation and corporate tax avoidance of European publicly listed firms?

Again, this question is answered for firms having low, moderate, and high corporate tax avoidance activity. The answer to this question provides researchers and policy makers with evidence about how board independence influences the relation between total senior executive compensation and tax avoidance of firms across the tax avoidance distribution. Consequently, the answer tells whether board independence, as a corporate governance mechanism, is effective in influencing corporate outcomes that are beneficial for shareholders (Schleifer & Vishny, 1997).

Thus, the main theoretical contribution of this study is creating consensus in the finance and accounting literature about the influence of total senior executive compensation on corporate tax avoidance and how this relationship is moderated by board independence.

1.3. Research Methodology

The answer to the research question about the influence of total senior executive compensation on corporate tax avoidance and the answer to the sub question about the influence of the proportion of strictly independent board members on the relation between total senior executive compensation and corporate tax avoidance are obtained by performing four panel data analyses. The research design is based on Seidman & Stomberg (2017). In each panel analysis, total senior executive compensation is included as an independent variable to estimate the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is moderate. Corporate tax avoidance activity is moderate when the firm-year observation falls in the middle tercile of the distribution of the tax avoidance measure. Besides, an interaction between total senior executive compensation and a dummy equal to 1 when the firm-year observation is in the lower tercile of the tax avoidance distribution is included. The single effect of total senior executive compensation and its interaction with the dummy of low tax avoidance are interpreted together to test the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is relatively low (hypothesis 1a). Moreover, an interaction between total senior executive compensation and a dummy equal to 1 when the firm-year observation is in the upper tercile of the tax avoidance distribution is included. The single effect of total senior executive compensation and its interaction with the dummy of high tax avoidance are interpreted together to test the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is relatively high (hypothesis 1b). The single senior executive compensation variable and the two interaction terms previously discussed are interacted with the proportion of strictly independent

board members and are included as independent variables to test whether board independence strengthens the influence of total senior executive compensation on corporate tax avoidance when corporate tax avoidance is relatively low or high (respectively hypothesis 2a and 2b). Besides, each panel analysis includes five control variables that are regarded by the literature as determinants of corporate tax avoidance, firm fixed effects, and industry-year fixed effects. The four panel analyses use different measures of corporate tax avoidance as the dependent variable: the effective tax rate, the long-term cash effective tax rate, the book-tax-gap, and the residual book-tax-gap. This brings the benefit of multiplicity, which means that the study's reliability is increased because corporate tax avoidance is measured in multiple ways. To obtain panel data with sufficient length in time and broadness in firms, data is collected from 2007 to 2021 for European publicly listed firms via the Eikon database.

As a first robustness test to the results of the main analysis, four panel data analyses are executed in which total senior executive compensation is proxied by the total remuneration – measured as the sum of annual salary, bonus, value of stocks awarded, value of options awarded, and value of long-term incentive plan awards – of the top-five-paid executives. The data regarding all variables are obtained from the Eikon database, except for the data regarding the total compensation of the top-five-paid executives, which are obtained from BoardEx. As a second robustness test, four panel models identical to the models in the main analysis are executed, except for that the dummy equal to 1 in a firm-year when the corporate tax avoidance measure is in the upper tercile is replaced by a dummy equal to 1 when pretax accounting income scaled by total assets in a firm-year is in the lower tercile of the distribution. Besides, the dummy equal to 1 in a firm-year when the corporate tax avoidance measure is in the lower tercile is replaced by a dummy equal to 1 when pretax accounting income scaled by total assets in a firm-year is in the upper tercile of the distribution. Besides undergoing several assumption tests, all twelve executed panel models are investigated on endogeneity.

1.4. Thesis Outline

The remainder of the study is organized as follows. Section 2 discusses the theoretical background. Section 3 discusses the research design. Section 4 discusses the findings of the research, divided in section 4.1 discussing the dataset, section 4.2 discussing the main findings regarding hypothesis 1a, 1b, 2a, and 2b, and section 4.3 discussing the robustness tests. Section 5 provides a discussion of the research. Section 6 provides the conclusion of the research, together with the limitations of the study and suggestions for future research.

2. Theoretical Background

The literature review starts with the definition of corporate tax avoidance and the most influential studies related to corporate tax avoidance published in top-ranked journals in section 2.1. Section 2.1.1 discusses motivations for corporate tax avoidance and section 2.1.2 discusses the determinants of corporate tax avoidance. After that, the definition of executive compensation and the most influential studies related to executive compensation published in top-ranked journal are discussed in section 2.2. Consequently, literature about a positive and negative relationship between executive compensation and corporate tax avoidance is discussed in section 2.3.1 and 2.3.2. Thereafter, literature that reconciles the coexistence of a positive and negative effect of executive compensation on corporate tax avoidance is discussed in section 2.3.3. Section 2.4 discusses the moderating influence of board independence on the relation between executive compensation and corporate tax avoidance. The literature discussed in section 2.3 and 2.4 is selected from top-ranked and lower-ranked journals due to the lower level of research in this area. Section 2.5 gives an overview of the research model that resulted from the hypothesis development throughout the literature review.

2.1. Corporate Tax Avoidance

From a law perspective, corporate tax avoidance refers to the activities that lower the tax burden of a firm within the boundaries of the law (Semaan, 2017; Wang et al., 2020). In defining corporate practices that are related to tax avoidance, it is important to distinguish between tax avoidance – often called legitimate tax avoidance – and tax evasion – i.e., noncompliance or illegal tax avoidance. Tax evasion is a more aggressive form of tax planning and differs from tax avoidance because such practices aim to evade tax obligations via breaking the law (Wang et al., 2020). While there is a clear distinction between tax avoidance and tax evasion from a judicial perspective, it is hard to identify and distinguish these activities with accounting data. The legality of a tax avoidance activity is namely determined *ex post*. Consequently, the measures of tax avoidance using accounting data include both tax activities that are ruled legal (tax avoidance) and illegal (tax evasion) (Hanlon & Heitzman, 2010). Therefore, the following definition of tax avoidance is widely used in the accounting and finance literature: "Anything that reduces the firm's effective tax rate over a long period, i.e., five years. Thus, our measure will reflect both tax deductions that are squarely in compliance with the law as well as those that result from grey-area interpretations" (Dyreng et al., 2008, p. 62). The definition of Dyreng et al. (2008) is used in this study.

2.1.1. Motivations of Corporate Tax Avoidance

In the literature, two broad motivations of corporate tax avoidance are widely discussed: the financial interest motivation and the social responsibility motivation. Both are discussed below.

The financial interest motivation of corporate tax avoidance is based on the rationale that tax avoidance leads to a higher net cash flow to the firm, resulting in more resources for investments and enhancing firm value (Wang et al., 2020). This rationale assumes that corporate tax avoidance has the objective to increase firm wealth and consequently shareholders' wealth (Shackelford & Shevlin, 2001). However, more recent tax avoidance research incorporates agency theory and considers that the decisions of managers (the agents) are based on their own goals and not on the goals of shareholders (the principals). Managers can namely use corporate tax avoidance activities to facilitate rent-extraction (Desai & Dharmapala, 2006). This means that managers use tax avoidance activities to increase net cash flows to the firm and consequently expropriate these cashflows to the detriment of the firm. Tax avoidance is a very effective strategy for managers to expropriate firm cashflows because tax avoidance strategies are likely to include sophisticated transactions, increasing information asymmetry between managers and shareholders (Desai et al., 2007). Considering the negative influence of corporate tax avoidance on firm value, Crocker & Slemrod (2005) state that the interests of shareholders and managers are better aligned when the penalties of illegal tax evasion are borne by the managers and when effective compensation contracts for executives are implemented.

The social responsibility motivation of corporate tax avoidance states that tax avoidance behavior is influenced by the motivation of corporate social responsibility inside the firm (Slemrod, 2004). Like the influence of financial motives on corporate tax avoidance, the presence of social responsibility motivations may implicate both more corporate tax avoidance or less corporate tax avoidance. If paying taxes is a social responsibility for firms and increases social wealth (Sikka, 2010), social responsibility motivations may implicate less corporate tax avoidance (Wang et al., 2020). On the other hand, when corporate tax avoidance is placed outside the realm of corporate social responsibility and taxes are merely seen as expenses, motivations of corporate social responsibility could lead to more corporate tax avoidance because tax avoidance creates larger internal cashflows that can be used for socially responsible actions (Davis et al., 2016).

2.1.2. Determinants of Corporate Tax Avoidance

The accounting and finance literature has identified multiple factors – besides executive compensation related factors – that influence the level of corporate tax avoidance. The five most discussed factors in the literature are discussed below. These factors are used as control variables in this study.

The first factor is firm size, because larger firms are more monitored by the public and must be more cautious about their legitimacy, resulting in less tax avoidance (Seidman & Stomberg, 2017; Wang & Yao, 2021). The second factor is leverage, because debt functions as a tax shield, leading to tax savings and consequently to less need for tax avoidance (Armstrong et al., 2012; Wang & Yao, 2021). The third factor is financial performance of the firm, because more profitable firms face higher taxes on profit. Therefore, literature expects that these firms are more inclined to minimize their tax liabilities, which means that they engage in more tax avoidance (Wang & Yao, 2021). Besides, more profitable firms have more resources to contract fiscal experts to help them with effective tax strategies (Eichfelder & Hechter, 2018). The fourth factor is the level of new investments made by the firm, because investments in most cases result in permanent differences between accounting income and taxable income (Armstrong et al., 2012). This is mainly due to differences in accounting and tax rules regarding investment tax credits, accelerated depreciation methods, and depreciation of bonusses (Armstrong et al., 2012, p. 399). The fifth factor is board independence, because more independent boards govern the firm stronger and mitigate agency problems (Wang et al., 2020). Consequently, firms with stronger governance are likely to engage in less tax avoidance, as less tax avoidance leads to less opportunity for managers to expropriate free cash flows (Jensen, 1986; Lanis & Richardson, 2011). More recent research has reexamined the relationship between board independence and corporate tax avoidance. Armstrong et al. (2015) find a positive relation between board independence and corporate tax avoidance at extreme low levels of corporate tax avoidance and a negative relation between board independence and corporate tax avoidance at extreme high levels of corporate tax avoidance. They propose that corporate governance mechanisms such as board independence alleviate agency problems at extreme levels of corporate tax avoidance, which means that better functioning governance mechanisms lead to a more optimal level of tax avoidance with respect to firm value and shareholder wealth in the long run.

2.2. Executive Compensation

The goal of this paragraph is to define senior executive compensation – i.e., executive compensation – and highlight the most dominant theories about the influence of executive pay on executive actions and consequently corporate outcomes. These theories can be divided into goal alignment, risk preference alignment, and goal misalignment theories.

Executive compensation is mainly composed of salary, bonus, stock awards, stock option awards, and long-term incentive plan awards (Chung & Pruitt, 1996; Fahlenbrach & Stulz, 2011). Other components, including fringe benefits, saving plans, and pensions, compose a small part of executive compensation in general. Databases mainly categorize total executive compensation – often called total remuneration – as the sum of salary, bonus paid, and equity at risk, in which equity at risk is defined as the sum of stock options awarded, stocks awarded, and long-term incentive plans awarded (BoardEx, 2022).

Goal alignment theories of compensation are based on the notion that the dependence of compensation on firm outcomes results in less opportunistic behavior of executives because executives are motivated to make firm value maximizing decisions (Devers et al., 2007). This theory is grounded in agency theory (Schleifer & Vishny, 1997).

Risk preference alignment theories of compensation assume that the risk preference of executives and shareholders differ naturally (Devers et al., 2007). Literature namely states that managers are – from a wealth perspective – overinvested in the firm and that shareholders can diversify their wealth in numerous ways (Milgrom & Roberts, 1992). This leads to the fact that shareholders are risk-neutral and that managers are risk-averse with respect to corporate decisions (Jensen & Meckling, 1976). Given the direct relationship between risk and return (Sharpe, 1970), it is assumed that managers avoid risks at the cost of potential returns (Devers et al., 2007). Consequently, a large body of literature has focused on the influence of executive pay on risk taking of executives. For example, Datta et al. (2001) find that stock option compensation stimulates CEOs to make riskier investment decisions, resulting in more risk alignment.

While the traditional agency framework assumes that executive compensation leads to alignment of risk attitudes and goals, there are also scholars who argue that executive compensation may negatively influence alignment of goals. Some scholars have found a positive relationship between executive compensation and abnormal share returns after the granting of stock options, indicating that executives opportunistically manage earnings and time option grants (Aboody & Kasznik, 2000; Lie, 2005; Yermack, 1997). Besides, Guidry et

al. (1999) show that variable executive compensation stimulates executives to maximize firm value in the short run at the expense of long run firm value. Thus, there is a large body of literature providing evidence for a negative effect of executive compensation on goal alignment of executives and shareholders. However, this does not mean that the costs of executive compensation outweigh the overall benefits with respect to incentivization of executives (Devers et al., 2007).

2.3. Relation between Executive Compensation and Corporate Tax Avoidance

Tax avoidance strategies have the goal to lower corporate tax expenses in a legal way, consequently increasing net income of the firm (Ansar et al., 2021). Literature provides theories for both a positive and negative relationship between executive compensation and corporate tax avoidance. After discussing the theories that hypothesize a positive or negative relationship, several theories are discussed that explain the coexistence of a positive and negative influence of executive compensation on corporate tax avoidance.

2.3.1. Positive Relation between Executive Compensation and Corporate Tax Avoidance

From an agency perspective, engaging in corporate tax avoidance is in the best interest of shareholders, because higher net income results in higher dividend payments or capital gains. However, management will not necessarily act in the best interest of the shareholders, because management wants to maximize its own economic welfare (Schleifer & Vishny, 1997). Agency theory predicts that compensation incentives lead to better alignment of managers' and shareholders' goals (Schleifer & Vishny, 1997). This means that managers have more incentives to increase net income and therefore increase corporate tax avoidance when their compensation depends on net income. Examples of variable compensation are bonusses, stocks granted, and options granted (Fahlenbrach & Stulz, 2011). Besides, managers have more incentives to increase net income and consequently corporate tax avoidance when their fixed compensation (salary) is sufficiently large compared to competitors, because the pain from potential dismissal when income is low is too large (Fahlenbrach & Stulz, 2011; Jensen & Meckling, 1976; Schleifer & Vishny, 1997). The positive relation between executive compensation and corporate tax avoidance is backed by empirical research. Ansar et al. (2021) investigate whether executive compensation influences the effective tax rate of firms from the Indonesia Stock Exchange and find a significant positive effect on corporate tax avoidance. Besides, Wang & Yao (2021) find that total compensation of the top three executives with the

highest compensation positively influences corporate tax avoidance of state-owned firms. Armstrong et al. (2015) find a positive effect of CEO equity incentives on corporate tax avoidance as well.

2.3.2. Negative Relation between Executive Compensation and Corporate Tax Avoidance

On the other hand, agency theory also suggests that increasing compensation for senior executives could lead to less corporate tax avoidance, because corporate tax avoidance can be seen as a value destroyer for shareholders. Corporate tax avoidance reduces shareholder value when the expenses related to tax avoidance strategies – i.e., reputational consequences of negative media coverage, tax consultant fees, and the risk of accidentally engaging in tax evasion and subsequently being penalized by tax authorities – outweigh the benefits of lower tax expenses through tax avoidance (Krieg & Li, 2021; Semaan, 2017). Desai & Dharmapala (2006) provide evidence for this hypothesized relationship, because they find that the ratio of stock options granted to total compensation for the top five executives negatively influences corporate tax avoidance. Moreover, Gill & Arora (2022) show that the fixed compensation (salary) of CFOs and CEOs of publicly listed firms on the Bombay Stock Exchange negatively influences corporate tax avoidance. Halioui et al. (2016) investigate both the effect of CEO salary and CEO stock option compensation on corporate tax avoidance and find negative relationships. Desai & Dharmapala (2006) state that a reason for a negative relationship between executive compensation and corporate tax avoidance could be that higher compensation for managers leads to less rent diversion of managers, meaning less expropriation of money from the firm via tax evasion. Because tax evasion decreases, tax avoidance decreases as well, because lower tax evasion activity increases the costs of engaging in tax avoidance activities for managers.

2.3.3. Coexistence of Positive and Negative Relationships between Executive Compensation and Corporate Tax Avoidance

The positive and negative relationships between total executive compensation or compensation components and corporate tax avoidance found in earlier studies seem quit contradictory. Consequently, some research has focused on the influence of corporate governance mechanisms on corporate tax avoidance at different levels of the corporate tax avoidance distribution (Armstrong et al., 2015; Seidman & Stomberg, 2017). This means that the relationship between executive compensation and corporate tax avoidance differs for different

levels of corporate tax avoidance. When corporate tax avoidance activity is relatively low on average, the relationship between corporate governance mechanisms and corporate tax avoidance is positive (Armstrong et al., 2015). In this situation, better functioning corporate governance mechanisms (higher total senior executive compensation) lead to better incentive alignment between managers and shareholders. This results in more corporate tax avoidance because the firm has underinvested in corporate tax avoidance (Wang et al., 2020). In case corporate tax avoidance activity is relatively low, the benefits of incremental corporate tax avoidance are namely likely to be higher than the costs of incremental corporate tax avoidance. Thus, more corporate tax avoidance is beneficial for shareholders when corporate tax avoidance is relatively low on average. Better incentive alignment between managers and shareholders – in Armstrong et al. (2015) their case through more board independence and more financially educated board members – is therefore likely to lead to more corporate tax avoidance when corporate tax avoidance is low on average. Thus, when total senior executive compensation increases, management acts more in the interest of shareholders, leading to more corporate tax avoidance when corporate tax avoidance activity is relatively low. This leads to the following hypothesis:

H1a: Total senior executive compensation has a positive effect on corporate tax avoidance of European publicly listed firms when tax avoidance activity is low.

On the other hand, when corporate tax avoidance is relatively high on average, Armstrong et al. (2015) argue that better functioning corporate governance mechanisms lead to less corporate tax avoidance, because incremental corporate tax avoidance is likely to have more costs than benefits. In other words, when corporate governance mechanisms function better, the incentives of managers and shareholders are better aligned, and consequently less corporate tax avoidance will take place when corporate tax avoidance activity is relatively high. High corporate tax avoidance is namely likely to destroy value for shareholders, as the costs of lower reputation (leading to lower customer demand), litigation, and transfer pricing are likely to be higher than the benefits of corporate tax avoidance (cost savings). In addition, Seidman & Stomberg (2017) use the methodology of Desai & Dharmapala (2006) and provide evidence that firms with a high level of tax avoidance show a negative relationship between equity compensation of executives and tax avoidance. In other words, firms that have negative marginal net benefits of engaging in tax avoidance will engage in less tax avoidance when executives' equity compensation increases and executives act more in line with shareholders'

goals. Thus, when corporate tax avoidance is high on average, better functioning corporate governance mechanisms (higher total senior executive compensation) will lead to less corporate tax avoidance. This leads to the following hypothesis:

H1b: Total senior executive compensation has a negative effect on corporate tax avoidance of European publicly listed firms when tax avoidance activity is high.

Hypotheses 1a and 1b implicate that there will be no effect of senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is moderate (Armstrong et al., 2015; Wang et al., 2020). In the situation of moderate – i.e., average – corporate tax avoidance activity, the marginal benefits and costs of corporate tax avoidance are namely likely to be equal, so there is no incentive to change the level of corporate tax avoidance for both senior executives (when their compensation changes) and shareholders.

2.4. The Moderating Role of Board Independence

Prior literature has extensively examined the effect of board independence on corporate outcomes, especially firm performance (Fuzi et al., 2016). Independent board members monitor senior executives and provide incentives to senior executives to act in shareholders' interest. Alkurdi & Mardini (2020) show that board independence significantly positively influences the effective tax rate of firms, indicating that board independence lowers corporate tax avoidance. However, Armstrong et al. (2015) state that it is not clear *ex ante* whether board independence has a negative or positive influence on corporate tax avoidance. When independent directors view corporate tax avoidance as desirable because it is directly profitable for shareholders, board independence may increase corporate tax avoidance. When independent directors view corporate tax avoidance as undesirable for shareholders because of the large potential costs in the form of penalties or weakened reputation, increased board independence may lead to less corporate tax avoidance. Given the extensive literature about a positive influence of board independence on firm performance (Abdullah, 2004; Ameer et al., 2010; Fuzi et al., 2016), it is assumed that more independent boards act more in the interest of shareholders. In line with this assumption, Armstrong et al. (2015) state that board independence mitigates relatively high or low levels of corporate tax avoidance, because more independent boards recognize the potential (opportunity) costs of relatively low or high corporate tax avoidance positions. Consequently, it is assumed that board independence

influences the relation between total executive compensation and corporate tax avoidance of European publicly listed firms in a positive way, given the relatively low or high level of corporate tax avoidance.

In the case that total senior executive compensation leads to more corporate tax avoidance – i.e., when corporate tax avoidance is relatively low – more board independence will strengthen this relationship because independent board members are likely to share shareholders' view that the benefits of corporate tax avoidance outweigh the costs in the lower part of the tax avoidance distribution (Armstrong et al., 2015). This leads to the following hypothesis:

H2a: The proportion of strictly independent board members has a positive effect on the relation between total senior executive compensation and corporate tax avoidance of European publicly listed firms when tax avoidance activity is low.

In the case that total senior executive compensation leads to less corporate tax avoidance – i.e., when corporate tax avoidance is relatively high – more board independence will strengthen this relationship because it is more likely that independent board members share shareholders' view that the costs of corporate tax avoidance outweigh the benefits in the upper part of the tax avoidance distribution (Armstrong et al., 2015). This leads to the following hypothesis:

H2b: The proportion of strictly independent board members has a positive effect on the relation between total senior executive compensation and corporate tax avoidance of European publicly listed firms when tax avoidance activity is high.

Hypotheses 2a and 2b implicate that there will be no effect of senior executive compensation on corporate tax avoidance and no moderating effect of board independence on this relationship when corporate tax avoidance activity is moderate (Armstrong et al., 2015; Wang et al., 2020). In the situation of moderate – i.e., average – corporate tax avoidance activity, the marginal benefits and costs of corporate tax avoidance are namely likely to be equal, so there is no incentive to change the level of corporate tax avoidance for senior executives (when their compensation changes), independent board members, and shareholders.

2.5. Research Model

The research model is composed of two parts, because the relationship between total senior executive compensation and corporate tax avoidance is expected to differ for different levels of corporate tax avoidance activity. Figure 1 describes hypothesis 1a and 2a, and Figure 2 describes hypothesis 1b and 2b. For reasons of clarity, the signs of the hypotheses are explained.

Hypothesis 1a states that total senior executive compensation has a positive influence on corporate tax avoidance when corporate tax avoidance activity is relatively low, i.e., when corporate tax avoidance has positive marginal net benefits. Hypothesis 1b states that total senior executive compensation has a negative influence on corporate tax avoidance when corporate tax avoidance activity is relatively high, i.e., when corporate tax avoidance has negative marginal net benefits. Hypothesis 2a states that the relationship between total senior executive compensation and corporate tax avoidance is strengthened by the proportion of strictly independent board members, given that the level of corporate tax avoidance activity is low. Hypothesis 2b states that the relationship between total senior executive compensation and corporate tax avoidance is strengthened by the proportion of strictly independent board members, given that the level of corporate tax avoidance activity is high.

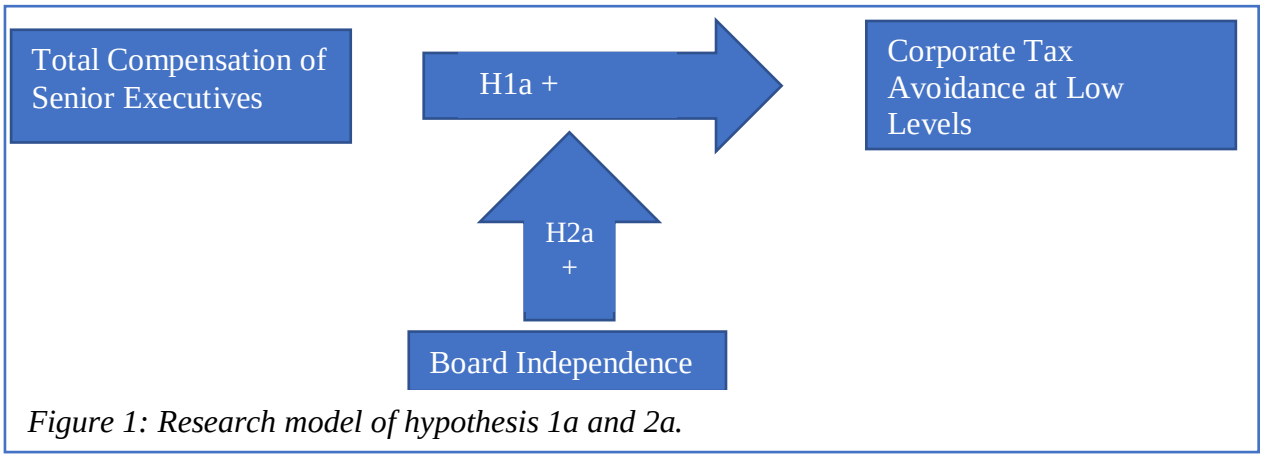

Figure 1: Research model of hypothesis 1a and 2a.

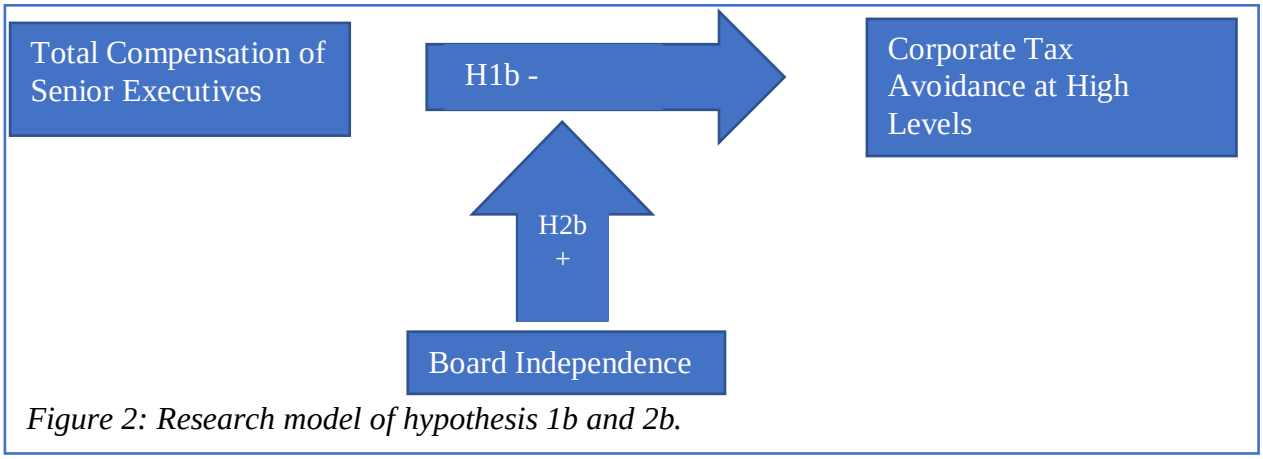

Figure 2: Research model of hypothesis 1b and 2b.

3. Research Design

3.1. Introduction

To research hypothesis 1a, 1b, 2a, and 2b, four panel regression analyses with firm and industry-year fixed effects are executed. The research design is based on Seidman & Stomberg (2017). In each regression, a measure of corporate tax avoidance functions as a dependent variable, and total senior executive compensation is included as an independent variable to estimate the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance is moderate (the reference category). Corporate tax avoidance is moderate when the firm-year observation falls in the middle tercile of the distribution of the tax avoidance measure. Besides, an interaction between total senior executive compensation and a dummy variable equal to 1 when the firm-year observation is in the lower tercile of the tax avoidance distribution is included. The effect of the single total senior executive compensation variable together with the interaction between total senior executive compensation and a dummy being 1 when corporate tax avoidance is low is used to test the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is low (hypothesis 1a). Moreover, an interaction between total senior executive compensation and a dummy variable equal to 1 when the firm-year observation is in the upper tercile of the tax avoidance distribution is included. The effect of the single total senior executive compensation variable together with the interaction between total senior executive compensation and a dummy being 1 when corporate tax avoidance is high is used to test the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is high (hypothesis 1b). The single senior executive compensation variable and the two interaction terms previously discussed are interacted with the proportion of strictly independent board members and are included as independent variables to test whether board independence strengthens the influence of total senior executive compensation on corporate tax avoidance, given that corporate tax avoidance activity is low or high (respectively hypothesis 2a and 2b). Besides, the five discussed control variables are included in the analysis. A panel data analysis is suitable to investigate the influence of total senior executive compensation on corporate tax avoidance because this method enables to measure the impact of total senior executive compensation on corporate tax avoidance of European publicly listed firms over multiple periods. The inclusion of firm fixed effects (a dummy for each firm) namely controls for the influence of omitted time-invariant and firm-specific factors that influence corporate tax avoidance. The inclusion of industry-year fixed

effects (a dummy for each industry-year pair) controls for the influence of omitted time-variant, industry-variant, and firm-invariant factors (within a specific industry) that influence corporate tax avoidance. In this way, the model corrects for industry-specific variables that change over time but impact firms inside the specific industry in the same way. Related to this study, examples are changes in tax regulations on the industry level that impact the level of corporate tax avoidance.

As a first robustness test, the hypotheses will be tested with four different panel regression analyses. These four panel models will be identical to the models in the main analysis that test hypothesis 1a, 1b, 2a, and 2b, except for that total senior executive compensation is proxied by the total remuneration of the top-five-paid senior executives (Seidman & Stomberg, 2017; Wang & Yao, 2021). Thus, in each panel analysis, the total remuneration of the top-five-paid senior executives – measured as the sum of annual salary, bonus, value of stocks awarded, value of options awarded, and value of long-term incentive plan awards based on the share price on the report date – functions as an independent variable to estimate the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is moderate (Desai & Dharmapala, 2006). The five best paid senior executives are defined as the five senior executives with the highest total remuneration in a firm-year. In each panel analysis, the interaction between the total compensation of the top-five-paid senior executives and a dummy variable equal to 1 when the firm-year observation is in the lower tercile of the tax avoidance distribution is included to test – together with the single variable of total compensation of the top-five-paid senior executives – the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is low (hypothesis 1a). An interaction between the total compensation of the top-five-paid senior executives and a dummy variable equal to 1 when the firm-year observation is in the upper tercile of the tax avoidance distribution is included to test – together with the single variable of total compensation of the top-five-paid senior executives – the effect of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is high (hypothesis 1b). The independent variable of total compensation of the top-five-paid executives and the two interaction terms previously discussed are interacted with the proportion of strictly independent board members and included as independent variables to test whether board independence strengthens the influence of total senior executive compensation on corporate tax avoidance when corporate tax avoidance activity is relatively low or high (respectively hypothesis 2a and 2b). Besides, each panel analysis includes five

control variables that are regarded by the literature as determinants of corporate tax avoidance, firm fixed effects, and industry-year fixed effects.

As a second robustness test, the hypotheses will be tested with four different panel regression analyses. These four panel models will be identical to the models in the main analysis that test hypothesis 1a, 1b, 2a, and 2b, except for the fact that the dummy equal to 1 in a firm-year when the corporate tax avoidance measure is in the upper tercile is replaced by a dummy equal to 1 when pretax accounting income scaled by total assets in a firm-year is in the lower tercile of the distribution. Besides, the dummy equal to 1 in a firm-year when the corporate tax avoidance measure is in the lower tercile is replaced by a dummy equal to 1 when pretax accounting income scaled by total assets in a firm-year is in the upper tercile of the distribution. Pretax accounting income scaled by total assets namely indicates the extent to which costs like research and development expenses are tax-deductible and consequently measures the extent to which corporate tax avoidance has marginal net benefits (Seidman & Stomberg, 2017).

Besides undergoing several assumption tests, the twelve executed panel regression models are investigated on endogeneity. It could namely be the case that total senior executive compensation and corporate tax avoidance are influenced by common unknown factors – e.g., changes in regulation – or that the causality operates in both directions (Bayar et al., 2018). This endogeneity bias leads to possible overestimation or underestimation of the effect of total senior executive compensation on corporate tax avoidance (Wooldridge, 2013). A 2SLS approach controls for potential endogeneity using the net profit margin and the level of sales of the firm in each year as instruments for total senior executive compensation. An instrument is a variable that is uncorrelated with corporate tax avoidance but correlated with senior executive compensation (Wooldridge, 2013).

3.2. Dependent Variables

In this study, corporate tax avoidance is measured by four different variables: the effective tax rate, the long-term cash effective tax rate, the book-tax-gap, and the residual book-tax-gap. Four different measures are used to measure corporate tax avoidance, because there is no perfect operationalization of corporate tax avoidance (Wang et al., 2020).

The first measure of corporate tax avoidance is the effective tax rate (ETR), measured as the ratio of current tax expense to pretax accounting income (Salihu et al., 2013). This

measure estimates the effectivity of the planning activities to avoid taxes. More corporate tax avoidance leads to a lower ETR, because corporate tax avoidance lowers tax expenses.

The second measure of corporate tax avoidance is the long-term cash effective tax rate (LTER). The LTER is measured as the average ratio of taxes paid to pretax accounting income in the last five years, i.e., year *t, t-1, t-2, t-3,* and *t-4* (Dyreng et al., 2008). In this way, the measure of corporate tax avoidance incorporates temporary differences. Temporary differences are differences between accounting and taxable income that will turn around and disappear in the long run (Salihu et al., 2013). More corporate tax avoidance leads to a lower LTER, because corporate tax avoidance reduces the effective cash taxes paid over a long period, i.e., five years (Dyreng et al., 2008).

The third measure of corporate tax avoidance is the total book-tax-gap (BTG). The BTG is the difference between pretax accounting income and taxable income, and the size of the BTG suggests the presence of corporate tax avoidance (Desai & Dharmapala, 2006; Salihu et al., 2013). In other words, more corporate tax avoidance leads to lower taxable income and consequently a larger BTG. Because taxable income is mostly not reported by firms, taxable income is estimated based on the methodology of Manzon & Plesko (2002). This methodology estimates taxable income by dividing current tax expense by the tax rate faced by the firm (incorporating the different tax rates due to progressivity) (Desai & Dharmapala, 2006). Consequently, the BTG is divided by lagged total assets.

The fourth measure of corporate tax avoidance is the residual book-tax-gap (Desai & Dharmapala, 2006). This measure considers the fact that large differences between accounting income and taxable income may not result from corporate tax avoidance but result from earnings management (accounting income is inflated). To isolate the part of the book-tax-gap that is due to earnings management, the book-tax gap is regressed against total accruals. Total accruals are equal to the difference between accounting net income and net operating cashflow, and are therefore a proxy of earnings management (Healy, 1985). Consequently, this methodology also considers that differences between accounting and taxable income can be temporary over time because changes in deferred tax assets and liabilities are included in the total accrual measure. The component of the book-tax-gap that cannot be explained by earnings management – i.e., the residual – is the proxy of corporate tax avoidance activity. This residual BTG is divided by lagged total assets. The described methodology is captured by Equation 1.

$$(1)\ BT_{i,t} = \beta_1 TA_{i,t} + \varepsilon_{i,t}$$

Equation 1: The book-tax-gap regressed against total accruals. The residual from this equation is the book-tax-gap due to corporate tax avoidance activities.

In Equation 1, $BT_{i,t}$ is the book-tax-gap for firm *i* in year *t* (accounting pretax income minus taxable income), $TA_{i,t}$ are the total accruals (net income minus net operating cashflow) for firm *i* in year *t*, and $\varepsilon_{i,t}$ is the residual for firm *i* in year *t* (book-tax-gap due to corporate tax avoidance). Thus, the residual book-tax-gap is given by Equation 2.

$$(2)\ Residual\ BTG_{i,t} = \varepsilon_{i,t}$$

Equation 2: The residual book-tax-gap is the residual from Equation 1. The residual book-tax-gap is the part of the book-tax-gap due to corporate tax avoidance activities.

3.3. Independent Variables

To test hypothesis 1a, 1b, 2a, and 2b, four different fixed effect models are estimated in the main analysis. In these four models, total senior executive compensation is measured as the compensation paid to all senior executives as reported by firm *i* in year *t*. This amount is denominated in units of million euros.

The dummy for high corporate tax avoidance activity equals 1 when the corporate tax avoidance measure in a firm-year falls in the upper tercile, i.e., the tercile with the largest tax avoidance observations throughout the sample, and 0 otherwise. The dummy for low corporate tax avoidance activity equals 1 when the corporate tax avoidance measure in a firm-year falls in the lower tercile, i.e., the tercile with the smallest tax avoidance observations throughout the sample, and 0 otherwise (Seidman & Stomberg, 2017).

The proportion of strictly independent board members is measured as the percentage of board members not being employed by the company, not serving on the board for more than ten years, not being a shareholder with more than 5% of holdings, not having cross-board membership, not having recent and immediate family ties to the corporation, and not accepting any compensation other than compensation for board service. This percentage is calculated on the end of the fiscal year (BoardEx, 2022).

3.4. Control Variables

Besides the proportion of strictly independent board members, four additional control variables are used to explain corporate tax avoidance in each regression. Firstly, firm size is measured

by the natural logarithm of total assets, in which total assets are denominated in units of million euros (Desai & Dharmapala, 2006; Wang & Yao, 2021). Secondly, firm leverage is measured by the ratio of total liabilities to total assets (Wang & Yao, 2021). Thirdly, financial firm performance is measured by the return on assets, which is net income after taxes divided by total assets (Mocanu et al., 2020; Wang & Yao, 2021). Fourthly, new investments made by the firm are measured with Equation 3.

$$(3)\ New\ investments_{i,t} = (Capital\ expenditures_{i,t} + Acquisitions_{i,t} + Net\ security\ investments_{i,t} - Sale\ of\ property_{i,t} - Depreciation_{i,t})/(Total\ assets_{i,t-1})$$

Equation 3: The methodology to determine the level of new investments made by firm i in year *t*.

In Equation 3, new investments are the sum of capital expenditures (containing purchases of fixed assets, purchases of intangibles, and software development costs), net security investments, and new business acquisition expenditures, minus the sum of property sold and depreciation, all divided by the lagged total assets of the firm (Armstrong et al., 2012; Richardson, 2006).

3.5. Data Analysis Method

Based on all discussed variables, the main analysis' four fixed effects models are specified to test hypothesis 1a, 1b, 2a, and 2b. The first fixed effects regression model is specified in Equation 4.

$$(4)\ \frac{Current\ tax\ expense}{Pretax\ accounting\ income}_{i,t} = \alpha_i + \alpha_{t,k} + \beta_0 + \beta_1 Compensation_{i,t} + \beta_2 Board\ independence_{i,t} + \beta_3 Compensation_{i,t} * Board\ independence_{i,t} + \beta_4 Compensation_{i,t} * Low\ tax\ avoidance\ activity_{i,t} + \beta_5 Compensation_{i,t} * Board\ independence_{i,t} * Low\ tax\ avoidance\ activity_{i,t} + \beta_6 Compensation_{i,t} * High\ tax\ avoidance\ activity_{i,t} + \beta_7 Compensation_{i,t} * Board\ independence_{i,t} * High\ tax\ avoidance\ activity_{i,t} + \beta_8 \ln(Total\ assets)_{i,t} + \beta_9 \frac{Total\ liabilities}{Total\ assets}_{i,t} + \beta_{10} \frac{Net\ income}{Total\ assets_{i,t}} + \beta_{11} New\ investments_{i,t} + \varepsilon_{i,t}$$

Equation 4: The first panel regression model used to explain tax avoidance of European publicly listed firms. The ETR is used as a measure of corporate tax avoidance. This model is used to test hypothesis 1a, 1b, 2a, and 2b.

In Equation 4, the ETR is used to measure corporate tax avoidance. β_1 is interpreted as the effect of total senior executive compensation on tax avoidance for firms having a moderate

level of tax avoidance activity, β_2 is interpreted as the effect of board independence on tax avoidance for firms having a moderate level of tax avoidance activity, and β_3 is interpreted as the effect of the interaction between total senior executive compensation and board independence on tax avoidance for firms having a moderate level of tax avoidance activity. The sum of β_1 and β_4 is interpreted as the effect of total senior executive compensation on tax avoidance for firms having a low level of tax avoidance activity (tests hypothesis 1a). The sum of β_3 and β_5 is interpreted as the interaction effect between total senior executive compensation and board independence on tax avoidance for firms having a low level of tax avoidance activity (tests hypothesis 2a). The sum of β_1 and β_6 is interpreted as the effect of total senior executive compensation on tax avoidance for firms having a high level of tax avoidance activity (tests hypothesis 1b). The sum of β_3 and β_7 is interpreted as the interaction effect between total senior executive compensation and board independence on tax avoidance for firms having a high level of tax avoidance activity (tests hypothesis 2b). β_8 is interpreted as the effect of firm size, β_9 is interpreted as the effect of leverage, β_{10} is interpreted as the effect of profitability, and β_{11} is interpreted as the effect of new investments on the level of corporate tax avoidance. To adjust for unmeasured time-invariant firm-specific factors, firm fixed effects (α_i) are included. To adjust for time-varying and industry-varying factors that impact firms inside an industry in the same way, industry-year fixed effects ($\alpha_{t,k}$) are included.

The second regression model is the same as in Equation 4, except for that the long-term cash effective tax rate measures corporate tax avoidance. The third regression model is the same as in Equation 4, except for that the book-tax-gap scaled by lagged total assets measures corporate tax avoidance. The fourth regression model is the same as in Equation 4, except for that the residual book-tax-gap scaled by lagged total assets measures corporate tax avoidance.

3.6. Assumption Tests

3.6.1. Endogeneity

To investigate endogeneity, the following steps are executed for all twelve fixed effects models. To illustrate the methodology, the fixed effects model of Equation 4 is taken as an example. Firstly, total senior executive compensation is regressed against all other independent variables (except the interaction terms that include total senior executive compensation) of Equation 4 and its two instruments (Wooldridge, 2013). The first instrument of total senior executive compensation is the level of sales of the firm per year (Deckop, 1988; Palia, 2001). Given the fact that the level of sales is often used as a managerial performance benchmark, agency theory

suggests that higher sales lead to higher compensation for executives (Palia, 2001). The second instrument of total senior executive compensation is the net profit margin. Deckop (1988) namely showed that higher profit margins directly lead to higher compensation for executives. This leads to the first-stage regression of the two-stage-least-squares (2SLS) model provided in Equation 5.

$$(5)\ Compensation_{i,t} = \pi_0 + \pi_1 Sales_{i,t} + \pi_2 \frac{Net\ income}{Sales}_{i,t} + \pi_3 \ln(Total\ assets)_{i,t} + \pi_4 \frac{Total\ liabilities}{Total\ assets}_{i,t} + \pi_5 \frac{Net\ income}{Total\ assets}_{i,t} + \pi_6 New\ investments_{i,t} + \pi_7 Board\ independence_{i,t} + v_{i,t}$$

Equation 5: The first-stage regression of the 2SLS model. The net profit margin and the level of sales are the instruments of total senior executive compensation.

In Equation 5, it is important that the two instruments have a significant influence on total senior executive compensation (Wooldridge, 2013). The residual from Equation 5 is stored and included in the regression model of Equation 4 (the hypothesized relationship). This leads to Equation 6.

$$(6)\ \frac{Current\ tax\ expense}{Pretax\ accounting\ income}_{i,t} = \alpha_i + \alpha_{t,k} + \beta_0 + \beta_1 Compensation_{i,t} + \beta_2 Board\ independence_{i,t} + \beta_3 Compensation_{i,t} * Board\ independence_{i,t} + \beta_4 Compensation_{i,t} * Low\ tax\ avoidance\ activity_{i,t} + \beta_5 Compensation_{i,t} * Board\ independence_{i,t} * Low\ tax\ avoidance\ activity_{i,t} + \beta_6 Compensation_{i,t} * High\ tax\ avoidance\ activity_{i,t} + \beta_7 Compensation_{i,t} * Board\ independence_{i,t} * High\ tax\ avoidance\ activity_{i,t} + \beta_8 \ln(Total\ assets)_{i,t} + \beta_9 \frac{Total\ liabilities}{Total\ assets}_{i,t} + \beta_{10} \frac{Net\ income}{Total\ assets}_{i,t} + \beta_{11} New\ investments_{i,t} + v_{i,t} + \varepsilon_{i,t}$$

Equation 6: The hypothesized relationship (Equation 4) plus the residual from Equation 5.

When the residual from Equation 5 ($v_{i,t}$) is significantly related to the measure of corporate tax avoidance at the 5% significance level in Equation 6, a 2SLS model is used because there is endogeneity in the fixed effects model of Equation 4 (Wooldridge, 2013). When the residual ($v_{i,t}$) is not significant in Equation 6, the fixed effects model of Equation 4 is the best model to test the hypotheses.

When a 2SLS model is the best way to estimate Equation 4, Equation 5 is regressed (the first stage), consequently the parameters of the independent variables are stored, and an estimate of total senior executive compensation is provided. Equation 6 is then run with the

instrumented version of total senior executive compensation (the second stage). This second-stage regression is captured by Equation 7.

$$(7)\ \frac{Current\ tax\ expense}{Pretax\ accounting\ income}_{i,t} = \alpha_i + \alpha_{t,k} + \beta_0 + \beta_1 Compensation^*_{i,t} + \beta_2 Board\ independence_{i,t} + \beta_3 Compensation^*_{i,t} * Board\ independence_{i,t} + \beta_4 Compensation^*_{i,t} * Low\ tax\ avoidance\ activity_{i,t} + \beta_5 Compensation^*_{i,t} * Board\ independence_{i,t} * Low\ tax\ avoidance\ activity_{i,t} + \beta_6 Compensation^*_{i,t} * High\ tax\ avoidance\ activity_{i,t} + \beta_7 Compensation^*_{i,t} * Board\ independence_{i,t} * High\ tax\ avoidance\ activity_{i,t} + \beta_8 \ln(Total\ assets)_{i,t} + \beta_9 \frac{Total\ liabilities}{Total\ assets}_{i,t} + \beta_{10} \frac{Net\ income}{Total\ assets}_{i,t} + \beta_{11} New\ investments_{i,t} + \varepsilon_{i,t}$$

Equation 7: The second-stage regression of the 2SLS method. $Compensation^*_{i,t}$ is the instrumented variable of total senior executive compensation based on the estimate of Equation 5.

To test whether the instruments and the non-instruments in Equation 5 are likely to be exogenous, the residual from Equation 7 is regressed against the independent variables of Equation 5 (the two instruments and all other independent variables). When the r-squared of this regression times the number of observations is higher than the chi-squared threshold at the 5% significance level (χ^2_q), where q is the number of instruments (2) minus the number of endogenous explanatory variables (1), then it is likely that at least one independent variable is not exogenous. This means that an omitted variable is likely to influence corporate tax avoidance via one of the instruments or that the issue of reversed causality has not been solved (Wooldridge, 2013). For proper interpretation of the results, it is required that this test indicates that all independent variables are likely to be exogenous.

If necessary, in the first robustness test, the total remuneration of the top-five-paid senior executives is instrumented in the same way as in the approach above. If necessary, in the second robustness test, total senior executive compensation is instrumented in the same way as above as well.

3.6.2. Other Assumption Tests

In the case that a fixed effects model is the best model to test the hypotheses (when endogeneity is not present), the fixed effects model is further tested for robustness. In the case that a 2SLS model is the best model to test the hypotheses (when endogeneity is present in a fixed effects model), the 2SLS model is further tested for robustness.

Firstly, the models are tested for serial correlation with the Wooldridge test (Wooldridge, 2002). Secondly, the models are tested for cross-sectional correlation with the Frees test (Frees, 1995). Thirdly, the models are tested for heteroskedasticity with the Breusch-Pagan multiplier test (Breusch & Pagan, 1980). In case the model suffers from serial correlation, cross-sectional correlation, or heteroskedasticity, a panel-corrected standard error (PCSE) model that corrects for these issues will be used to test the hypotheses (Beck & Katz, 1995). Fourthly, the models are tested for the fact of whether they have a normally distributed residual with a zero population mean. When this is not the case, hypothesis testing could be influenced, and the results of the specific model may be biased. The extended Jarque-Bera test (Alejo et al., 2015) is used to test whether the residual is normally distributed. The residual distribution plot is used to indicate whether the residual has a zero population mean. Fifthly, the variance inflation factor (VIF) is used to test whether each independent variable in a model is uncorrelated with the other independent variables, firm fixed effects, and industry-year fixed effects. In case all VIFs are below ten, multicollinearity is not problematic (Studenmund, 2016). Sixthly, the Pearson correlation coefficients between each independent variable and the residual of a specific model are provided. When all correlation coefficients lay between -0.1 and 0.1, correlation is weak or absent. This means that the variation in the specific corporate tax avoidance measure caused from the residual is not assigned to the independent variables. Seventhly, the Harris-Tzavalis test is used to test whether the dependent variables and the independent variables in all models are stationary (Harris & Tzavalis, 1999). This test investigates whether a specific panel variable is stable over time for all entities, given that the panel variable has more entities than time periods.

3.7. Sample Selection and Data Sources

3.7.1. Sample Selection

The study will focus on yearly data of European publicly listed firms from 2007 to 2021, resulting in a panel analysis with sufficient entities and time periods (Wooldridge, 2002). Research has namely not investigated the effect of total senior executive compensation on corporate tax avoidance for a sample of European publicly listed firms (Ansar et al., 2021; Armstrong et al., 2012; Armstrong et al., 2015; Desai & Dharmapala, 2006; Wang et al., 2020; Wang & Yao, 2021). Therefore, it has been hard to generalize the findings of prior research on the influence of senior executive compensation (components) on corporate tax avoidance to European firms with different institutional backgrounds and corporate governance regimes that

influence corporate outcomes such as tax avoidance (La porta et al., 2000; Wang et al., 2020). A time frame from 2007 to 2021 is chosen, because research has only focused on short time frames (Ansar et al., 2021; Armstrong et al., 2015; Wang et al., 2020), or nonrecent time frames (Desai & Dharmapala, 2006; Seidman & Stomberg, 2017). Consequently, the study's results are more generalizable over time and robust to time-varying factors – e.g., tax avoidance regulations – that influence corporate tax avoidance in a given country in the same way.

For the main analysis of hypothesis 1a, 1b, 2a, and 2b, all available data from Eikon for European publicly listed firms from 2007 to 2021 are collected. Firms are excluded from the sample when data are missing for all variables in one or more years. Furthermore, the previous year value is used when a variable misses a single year value (Grosse-Rueschkamp et al., 2019).

For the first robustness analysis, data from BoardEx regarding the total remuneration of the top-five-paid senior executives are collected additionally. These data are collected for the European publicly listed firms from 2007 to 2021 being previously analyzed in the main analysis of hypothesis 1a, 1b, 2a, and 2b. In case data regarding the total remuneration of the top-five-paid senior executives are only available for less than five executives in a year, the previous value of total top-five executive compensation is used for that year. When data are missing for two subsequent years, the firm is excluded from the analysis.

3.7.2. Data Sources

For the main analysis of hypothesis 1a, 1b, 2a, and 2b, all data are collected via Eikon, except for some dependent variables. As stated before, taxable income is namely generated by dividing current tax expense by the tax rate faced by the firm (incorporating the different tax rates due to progressivity). The corporate tax rates over time per European country are collected via KPMG (2022). Eikon is used as a data source because it includes financial and governance related firm-specific data for publicly listed firms. Moreover, some variables are generated by variables obtained from Eikon. The measure of the residual book-tax-gap is namely generated by using Equation 1 and taking the residual from the related regression. Besides, new investments are generated by Equation 3.

For the first robustness analysis, the same applies as for the main analysis of hypothesis 1a, 1b, 2a, and 2b, except for that the data regarding the total remuneration of the top-five-paid senior executives are collected from BoardEx via Wharton Research Data Services (WRDS). BoardEx is used to collect data because this database includes executive-specific compensation data.

4. Results

4.1. Descriptives

Table 1 provides the summary statistics of the four different variables that measure corporate tax avoidance (ETR, LTER, BTG scaled by lagged total assets, and residual BTG scaled by lagged total assets), total senior executive compensation, the percentage of strictly independent board members, and the four control variables for all 387 European publicly listed firms. All values are based on yearly observations from 2007 to 2021. The average effective tax rate (ETR) is 21.54%, the average long-term cash effective tax rate (LTER) is 23.68%, the average ratio of the BTG to lagged total assets is -0.3%, and the average ratio of the residual BTG to lagged total assets is 7.16%. The average amount of total senior executive compensation is 12.68 million euro, the average ratio of strictly independent board members is 59.30%, the average ratio of total liabilities to total assets is 65.82%, the average ratio of net income after taxes to total assets is 5.08%, the ratio of new investments to lagged total assets is 11.31%, and the average natural logarithm of total assets is 9.13. The total observations per variable are 5,805, which is equal to the total number of firms (387) times the total number of years (15).

Table 1: Summary statistics of the effective tax rate (ETR), long-term cash effective tax rate (LTER), the ratio of the book-tax-gap to lagged total assets, the ratio of the residual book-tax-gap to lagged total assets, total senior executive compensation, the percentage of strictly independent board members, the ratio of total liabilities to total assets, the ratio of net income after taxes to total assets, the ratio of new investments to lagged total assets, and the natural logarithm of total assets. Summary statistics are provided for the total sample size of 387 European publicly listed firms (Firms=387; T=15).

	Mean	Median	Std. D.	N
ETR	0.2154	0.2291	2.0687	5805
LTER	0.2368	0.2205	1.0979	5805
Ratio of BTG to lagged total assets	-0.0030	0.0000	0.0599	5805
Ratio of residual BTG to lagged total assets	0.0716	0.0297	0.1956	5805
Total senior executive compensation	12.6769	6.6353	50.1520	5805
Ratio of strictly independent board members (%)	59.3038	60.0000	23.9424	5805
Ratio of total liabilities to total assets	0.6582	0.6469	0.2379	5805
Ratio of net income after taxes to total assets	0.0508	0.0414	0.1100	5805
Ratio of new investments to lagged total assets	0.1131	0.0863	0.2176	5805
Natural logarithm of total assets	9.1322	8.8700	1.9618	5805

The sample consists of European publicly listed firms from Austria, Belgium, Denmark, Finland, France, Germany, The Republic of Ireland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. Most of the firms are from the UK (38.24%), followed by France (11.14%), and Germany (11.11%). The number of firms per

European country are provided in Appendix 1. The sample can also be categorized based on industry type (see Appendix 2). Most firms are active in industrials (21.45%), followed by consumer cyclicals (16.80%), and financials (14.73%).

Table 1 shows that the median approximates the mean of every variable. This indicates that the variables are relatively strong symmetrically distributed, supporting hypothesis testing. The summary statistics of the ratio of BTG to lagged total assets, the ratio of residual BTG to lagged total assets, the ratio of total liabilities to total assets, the ratio of net income after taxes to total assets, and the ratio of new investments to lagged total assets are not surprising as these values mostly lay between zero and one because total assets form the denominator. The mean and standard deviation of the ratio of strictly independent board members are not surprising as well, because this percentage can only vary between 0% and 100%. The summary statistics of the natural logarithm of total assets are not surprising as well, because the standard deviation is a proportion of the mean. The standard deviation of the ratio of BTG to lagged total assets, the ratio of residual BTG to lagged total assets, and total senior executive compensation are relatively high compared to the mean and median, but this is not surprising as tax avoidance activity and compensation levels logically vary between firms of different sizes and industries. The only statistics that surprise are the standard deviation of the ETR and LTER, being higher than one. This means that it is quite common for firms to have a volatile ETR and LTER. However, this can be explained by the temporary differences between pretax accounting income and taxable income that counterbalance over time.

Besides, Appendices 3, 4, 5, and 6 show the results of the Harris-Tzavalis test of stationarity of the dependent variable and all independent variables in the four main models. The Harris-Tzavalis test inspects the stationarity in panel data with a fixed number of time periods and more panels than time periods (Harris & Tzavalis, 1999). These statistics show whether a variable has a constant variance and constant mean from 2007 to 2021, which is important for the credibility of the study's results. The null hypothesis of the Harris-Tzavalis test is that panels – i.e., firms – are non-stationary. The probability is 0.000 for all variables, which means that the null hypothesis is rejected at the 5% significance level. Therefore, all variables have a constant mean and constant variance.

4.2. Main Findings

4.2.1. Assumption Testing

The first PCSE model estimates Equation 4, meaning that the effect of total senior executive compensation and the interaction effect of total senior executive compensation and the proportion of strictly independent board members on corporate tax avoidance (measured by the ETR) of European publicly listed firms are analyzed. Besides, the first PCSE model controls for the effect of the natural logarithm of total assets, the proportion of strictly independent board members, the ratio of total liabilities to total assets, the ratio of net income after taxes to total assets, the ratio of new investments to lagged total assets, firm fixed effects, and industry-year fixed effects. The first column of Table 2 shows the results of the first PCSE model. The PCSE model uses one autoregressive – called AR(1) – parameter for the whole panel model, which is preferred to panel-specific AR(1) parameters (Beck & Katz, 1995). A PCSE (panel-corrected standard error) model is used to estimate Equation 4, because serial correlation, heteroskedasticity, and cross-sectional correlation are present in the OLS fixed effects model that estimates Equation 4 (see Appendix 7, column 1). The Wooldridge test namely shows that serial correlation is present, the Frees test shows that cross-sectional correlation is present, and the Breusch-Pagan Lagrange multiplier test shows that heteroskedasticity is present in the OLS fixed effects model that estimates Equation 4 (see Appendix 8). The same conditions hold when an OLS fixed effects model is used to estimate Equation 4 with the LTER, the BTG scaled by lagged total assets, and the residual BTG scaled by lagged total assets as the dependent variable. Besides, the four OLS fixed effects models are inspected on endogeneity. Only the first OLS fixed effects model (ETR as dependent variable) suffers from endogeneity issues. Therefore, the first PCSE model also corrects for endogeneity by using the 2SLS method as discussed in section 3.6.1.

It could be the case that the PCSE models have no normally distributed residual with a zero population mean, which could influence hypothesis testing and could bias the results of the PCSE models. The distribution of the residual of the first PCSE model is provided in Appendix 9, accompanied with a fitted normal distribution line. This residual distribution plot indicates that the residual is quit normally distributed, though the extended Jarque-Bera test for normality is used to formally test whether the residual is normally distributed. The null hypothesis of this test is that the residual is normally distributed. The chi-squared value of this test is 5.51 with a probability of 0.0636, which means that the null hypothesis cannot be rejected at the standard 5% significance level, and that the residual is normally distributed. Furthermore,

the residual distribution plot indicates that the residual has a zero population mean. This is supported by the fact that the population mean of the residual is equal to zero when the residual variable is inspected. Thus, there are no potential problems resulting from the distribution of the residual of the first PCSE model in Table 2. Besides, the variance inflation factors (VIF) for the eleven independent variables of the first PCSE model are provided in Appendix 13. The VIFs are computed by a post-estimation collinearity method and approach the same VIFs in case each independent variable was panel-regressed against the other ten independent variables, firm fixed effects, and industry-year fixed effects. All FIVs are below ten, indicating that multicollinearity is not problematic in the first PCSE model (Studenmund, 2016). On top of that, the Pearson correlation coefficients between each independent variable of the first PCSE model and the residual are provided in Appendix 17. All correlation coefficients lay between -0.05 and 0.05, and some are even equal to zero, indicating weak or even absent correlation between the residual and the independent variables and that variation in the dependent variable (ETR) caused from the residual is not assigned to the independent variables. All conditions are the same under the other three PCSE models of Table 2. The tests and plots discussed related to the first PCSE model are also provided in the appendices for the other three PCSE models.

4.2.2. Findings First PCSE Model

The first PCSE model contains 15 years and 387 firms, leading to 5,805 firm level observations. The model has a Wald-chi-squared value of 5,101.44 with a probability of 0.000, indicating that the model is significant in explaining corporate tax avoidance of European publicly listed firms at the 5% significance level. The reported R^2 in column 1 of Table 2 shows that 11.39% of the variation in the ETR can be explained by the independent variables within every firm. Further, a test is carried out to investigate whether the included firm fixed effects are significant. The Wald-chi-squared value is 5,476.31 with a probability of 0.000, indicating that the null hypothesis can be rejected at the 5% significance level and that a part of firm variation in the ETR can be taken away by firm fixed effects. Another test is carried out to investigate whether the industry-year fixed effects significantly explain corporate tax avoidance in the first PCSE model. The Wald-chi-squared value is 3,701.00 with a probability of 0.000, suggesting that the null hypothesis can be rejected at the 5% significance level and that the inclusion of industry-year fixed effects increases the explanatory power of the first PCSE model.

Table 2: The four PCSE models that estimate the impact of total senior executive compensation on corporate tax avoidance of European publicly listed firms. All models correct for serial correlation, cross-sectional correlation, and heteroskedasticity. Firm and industry-year fixed effects are included in each model but left out in the table for ease of exposition. The effective tax rate (ETR), the long-term cash effective tax rate (LTER), the ratio of the book-tax-gap to lagged total assets, and the ratio of the residual book-tax-gap to lagged total assets function as the dependent variable in respectively model 1, 2, 3, and 4. ***, **, * denote significance at the 1, 5, and 10% level, respectively. Standard errors are in parenthesis. The first PCSE model also corrects for endogeneity by using the 2SLS method as described in section 3.6.1.

VARIABLES	PCSE (1) ETR	PCSE (2) LTER	PCSE (3) BTG / lagged assets	PCSE (4) Residual BTG / lagged assets
TSEC	-0.00048	-0.00287	-0.00008	-0.00006
	(0.01277)	(0.01082)	(0.00034)	(0.00027)
BI	-0.00509**	-0.00061	-0.00008	-0.00029***
	(0.00239)	(0.00094)	(0.00005)	(0.00008)
TSEC*BI	0.00003	-0.00006	0.000001	0.00001
	(0.00014)	(0.00020)	(0.000002)	(0.00004)
TSEC*LTAA	-0.00848	-0.00296**	0.00214***	0.00041*
	(0.00869)	(0.00122)	(0.00032)	(0.00025)
TSEC*BI*LTAA	-0.00022*	0.00003	0.00003***	0.00001***
	(0.00013)	(0.00002)	(0.000004)	(0.000004)
TSEC*HTAA	0.03175***	0.00179	-0.00018	-0.00286***
	(0.00716)	(0.00119)	(0.00013)	(0.00058)
TSEC*BI*HTAA	0.00011	0.00001	-0.000004**	-0.00007***
	(0.00009)	(0.00002)	(0.000002)	(0.00001)
Ln(assets)	-0.16898**	-0.04080	0.01788***	-0.06307***
	(0.08332)	(0.04081)	(0.00370)	(0.00836)
Liabilities/assets	0.20708	0.15459**	-0.06424***	-0.03809
	(0.22946)	(0.07460)	(0.01356)	(0.03229)
Net income/assets	0.32373	-0.04712	0.38449***	0.37576***
	(0.29734)	(0.09136)	(0.03152)	(0.09276)
New investments	0.04060	0.03114	-0.00392	0.05506***
	(0.05326)	(0.02704)	(0.00382)	(0.00759)
Constant	1.76269**	0.50385**	-0.14996***	0.71224***
	(0.85841)	(0.25755)	(0.02651)	(0.09174)
Observations	5805	5805	5805	5805
Number of firms	387	387	387	387
Firm FE	YES	YES	YES	YES
Industry-year FE	YES	YES	YES	YES
R-squared	0.1139	0.1746	0.4848	0.7808

The results in Table 2 indicate that total senior executive compensation (TSEC) has a positive impact on corporate tax avoidance of European publicly listed firms with moderate levels of corporate tax avoidance activity (the marginal net benefits of corporate tax avoidance approach zero). The standardized coefficient of -0.00048 namely indicates that an increase of one million euros in TSEC results in a 0.048% decrease of the ETR. This effect is insignificant at the 10% significance level. In other words, the results support the rationale that TSEC does not influence corporate tax avoidance when the marginal net benefits of corporate tax avoidance approach

zero. Furthermore, the first PCSE model shows a positive interaction effect between TSEC and the ratio of strictly independent board members (BI). The coefficient suggests that the ETR increases 0.003% when the interaction term increases with one unit for firms with zero-approaching marginal net benefits of corporate tax avoidance. This effect is insignificant at the 10% significance level. Thus, the effect of TSEC on corporate tax avoidance is not strengthened by BI for firms with moderate levels of corporate tax avoidance activity. This is in line with the rationale that shareholders, independent board members (acting in the name of the shareholders) and top management have no incentive to change corporate tax avoidance activity when the marginal net benefits approach zero (Armstrong et al., 2015). Besides, the results in Table 2 indicate that TSEC has a positive impact on corporate tax avoidance of European publicly listed firms with low levels of corporate tax avoidance activity (LTAA). The standardized coefficient of -0.00848 indicates that an increase of one million euros in TSEC results in a 0.848% decrease of the ETR. This effect is insignificant at the 10% significance level. This insignificant result **does not support hypothesis 1a** that TSEC has a positive effect on corporate tax avoidance when corporate tax avoidance activity is low, i.e., when the marginal net benefits of corporate tax avoidance are positive. Furthermore, the results in Table 2 indicate that TSEC has a negative impact on corporate tax avoidance of European publicly listed firms with high levels of corporate tax avoidance activity (HTAA). The standardized coefficient of 0.03175 indicates that an increase of one million euros in TSEC results in a 3.175% increase of the ETR. This effect is significant at the 1% significance level. This result **supports hypothesis 1b** that TSEC has a negative effect on corporate tax avoidance when corporate tax avoidance activity is high, i.e., when the marginal net benefits of corporate tax avoidance are negative. Moreover, the first PCSE model shows a negative interaction effect between TSEC, BI, and LTAA. The coefficient suggests that the ETR decreases with 0.022% when the interaction term increases with one unit for firms with positive marginal net benefits of corporate tax avoidance. This effect is significant at the 10% significance level, which **supports hypothesis 2a** that BI has a positive strengthening effect on the relation between TSEC and corporate tax avoidance when corporate tax avoidance activity is low, i.e., when the marginal net benefits of corporate tax avoidance are positive. Furthermore, the first PCSE model shows a positive interaction effect between TSEC, BI, and HTAA. The coefficient suggests that the ETR increases with 0.011% when the interaction term increases with one unit for firms with negative marginal net benefits of corporate tax avoidance. This effect is insignificant at the 10% significance level, which **does not support hypothesis 2b** that BI has a positive strengthening effect on the relation between TSEC and corporate tax avoidance when

corporate tax avoidance activity is high, i.e., when the marginal net benefits of corporate tax avoidance are negative.

In the first PCSE model, the natural logarithm of total assets has a coefficient of -0.16898, suggesting that an increase of 1 unit in the natural logarithm of total assets decreases the ETR with 16.898%. This effect is significant at the 5% significance level. The significant negative effect on the ETR is not in line with the theory that bigger firms are more monitored by the public and must be more cautious about their legitimacy, resulting in less corporate tax avoidance (Seidman & Stomberg, 2017; Wang & Yao, 2021). However, the negative effect on ETR can be explained by the rationale that bigger firms have more resources to attract tax specialists and increase corporate tax avoidance (Wang & Yao, 2021). The ratio of total liabilities to total assets has a coefficient of 0.20708, suggesting that an 1% increase in this ratio increases the ETR with 0.20708%. This effect is insignificant at the 10% significance level. The insignificant positive effect does not support the expected positive relationship. The ratio of net income after taxes to total assets has a coefficient of 0.32373, suggesting that an 1% increase in this ratio increases the ETR with 0.32373%. This effect is insignificant at the 10% significance level. The insignificant positive effect does not support the expected negative relationship. The ratio of new investments to lagged total assets has a coefficient of 0.04060, suggesting that an 1% increase in this ratio increases the ETR with 0.04060%. This effect is insignificant at the 10% significance level and does not support the expected negative relationship. The ratio of strictly independent board members has a coefficient of -0.00509, suggesting that an 1% increase in this ratio decreases the ETR with 0.509%. This effect is significant at the 5% significance level and does not supports the expected positive relationship. The constant of the first PCSE model is 1.76269 and is significant at the 5% significance level.

4.2.3. Findings Second PCSE Model

The results of the second PCSE model are given in the second column of Table 2. The R^2 is 17.46%, which means that this model can explain more variance in the corporate tax avoidance measure than the first PCSE model. The number of observations and number of firms are the same as in the first PCSE model. The significance of the model, firm fixed effects, and the industry-year fixed effects are approximately equal to their values in the first PCSE model. The second PCSE model makes it possible to investigate whether the conclusions of the first PCSE model hold by using the LTER as a measure of corporate tax avoidance. The LTER is seen by scholars as a more precise measure of corporate tax avoidance than the ETR, because the LTER controls for temporary differences between pretax accounting income and taxable income

(Salihu et al., 2013). Therefore, the results of the second PCSE model are preferred to the results of the first PCSE model for hypothesis testing. All control variables in the second PCSE model have the same sign as in the first model, except for the ratio of net income after taxes to total assets which is now in line with the theories that more profitable firms engage in more tax avoidance due to progressivity of the tax system and that more profitable firms can afford more tax experts (Eichfelder & Hechter, 2018; Wang & Yao, 2021). As in the first PCSE model, both TSEC and the interaction between BI and TSEC do not significantly influence corporate tax avoidance in the second PCSE model. Unlike the first PCSE model, the second PCSE model shows a significant negative interaction effect between TSEC and LTAA. This effect is significant at the 5% significance level and **supports hypothesis 1a**. However, the second PCSE model **does not support hypothesis 1b, 2a, and 2b**. Thus, the results of the first PCSE model – which support hypothesis 1b and 2a – do not lead to the same conclusion as the second PCSE model. A potential reason of the insignificant results related to hypothesis 1b, 2a and 2b could be that the LTER does not fully capture corporate tax avoidance and captures a lot of noise – i.e., variance in the LTER that is not caused by corporate tax avoidance (Wang & Yao, 2021). For example, a regulatory lowering of tax rates through the years – which is the case in most European countries – could lead to a lowering of the LTER that is not caused by corporate tax avoidance. Due to these measurement issues, literature has created two more precise but still imperfect measures of corporate tax avoidance, namely the book-tax-gap and the residual book-tax-gap (Desai & Dharmapala, 2006).

4.2.4. Findings Third PCSE Model

Consequently, the third PCSE model in the third column of Table 2 uses the book-tax-gap (BTG) scaled by lagged total assets as the dependent variable. The R^2 is 48.48%, which is much higher than the previous two PCSE models. Almost all control variables are significant at the 1% significance level and have the expected sign, except for that the ratio of new investments to lagged total assets does not have the expected sign and that this latter variable and BI insignificantly influence corporate tax avoidance at the 10% significance level. The results in Table 2 indicate that TSEC has an insignificant negative impact on corporate tax avoidance of European publicly listed firms with moderate levels of corporate tax avoidance activity. The coefficient of -0.00008 namely indicates that an increase of one million euros in TSEC results in a 0.008% decrease in the ratio of BTG to lagged total assets. This effect is insignificant at the 10% significance level. In other words, the results support the rationale that

TSEC does not influence corporate tax avoidance when the marginal net benefits of corporate tax avoidance are zero. Furthermore, the third PCSE model shows a positive interaction effect between TSEC and BI. The coefficient suggests that the ratio of BTG to lagged total assets increases 0.0001% when the interaction term increases with one unit for firms with zero marginal net benefits of corporate tax avoidance. This effect is insignificant at the 10% significance level. Thus, the effect of TSEC on corporate tax avoidance is not strengthened by BI for firms with zero marginal net benefits of corporate tax avoidance. This is in line with the theory that there is no incentive to change corporate tax avoidance activities when the marginal net benefits approach zero (Armstrong et al., 2015). Besides, the results in Table 2 indicate that TSEC has a positive impact on corporate tax avoidance of European publicly listed firms with positive marginal net benefits of corporate tax avoidance. The coefficient of 0.00214 indicates that an increase of one million euros in TSEC results in a 0.214% increase in the ratio of BTG to lagged total assets. This effect is significant at the 1% significance level. This significant result **supports hypothesis 1a**. Furthermore, the results in Table 2 indicate that TSEC has a negative impact on corporate tax avoidance of European publicly listed firms with negative marginal net benefits of corporate tax avoidance. The coefficient of -0.00018 indicates that an increase of one million euros in TSEC results in a 0.018% decrease in the ratio of BTG to lagged total assets. This effect is insignificant at the 10% significance level. Consequently, this result **does not support hypothesis 1b**. Moreover, the third PCSE model shows a negative interaction effect between TSEC, BI, and LTAA. The coefficient suggests that the ratio of BTG to lagged total assets decreases with 0.003% when the interaction term increases with one unit for firms with positive marginal net benefits of corporate tax avoidance. This effect is significant at the 1% significance level, which **supports hypothesis 2a**. Furthermore, the third PCSE model shows a negative interaction effect between TSEC, BI, and HTAA. The coefficient suggests that the ratio of BTG to lagged total assets decreases with -0.0004% when the interaction term increases with one unit for firms with negative marginal net benefits of corporate tax avoidance. This effect is significant at the 5% significance level, which **supports hypothesis 2b**. Thus, the third PCSE model supports all hypotheses, except for hypothesis 1b. However, the sign of the interaction between TSEC and HTAA is in the expected direction and the p-value is slightly above the 10% significance level. This insignificant effect can be explained by the fact that the ratio of BTG to lagged total assets is still an imperfect measure of corporate tax avoidance. For example, the measure does not control for the effect of earnings management on the BTG (Healy, 1985).

4.2.5. Findings Fourth PCSE Model

Therefore, the fourth PCSE model in the fourth column of Table 2 uses the residual BTG scaled by lagged total assets as the dependent variable. This measure controls for the effect of earnings management on the book-tax-gap (see section 3.2). The R^2 is 78.08%, which is much higher than the previous PCSE models. All control variables are significant at the 1% significance level and have the expected sign, except for that the ratio of total liabilities to total assets insignificantly influences tax avoidance at the 10% significance level. The results in Table 2 indicate again that TSEC has an insignificant negative impact on corporate tax avoidance of firms with moderate levels of corporate tax avoidance activity. In other words, the results support the rationale that TSEC does not influence corporate tax avoidance when the marginal net benefits of corporate tax avoidance approach zero. Furthermore, the fourth PCSE model shows an insignificant positive interaction effect between TSEC and BI. Thus, the effect of TSEC on corporate tax avoidance is not strengthened by BI for firms with zero marginal net benefits of corporate tax avoidance, which is in line with the theory that there is no incentive to change corporate tax avoidance activities when the net marginal benefits of corporate tax avoidance approach zero (Armstrong et al., 2015). Besides, the results in Table 2 indicate that the interaction between TSEC and LTAA has a positive impact on corporate tax avoidance. The coefficient of 0.00041 indicates that an increase of one million euros in TSEC results in a 0.041% increase in the ratio of residual BTG to lagged total assets when the marginal net benefits of corporate tax avoidance are positive. This effect is significant at the 10% significance level and **supports hypothesis 1a**. Besides the statistical significance, this variable has a significant economic influence because one standard deviation increase in TSEC increases the ratio of residual BTG to lagged total assets with 2.06% for firms with positive marginal benefits of corporate tax avoidance. Furthermore, the results in Table 2 indicate that the interaction between TSEC and HTAA has a negative impact on corporate tax avoidance. The coefficient of -0.00286 indicates that an increase of one million euros in TSEC results in a 0.286% decrease in the ratio of residual BTG to lagged total assets when the marginal net benefits of corporate tax avoidance are negative. This effect is significant at the 1% significance level and **supports hypothesis 1b**. Besides, this variable has a significant economic influence because one standard deviation increase in TSEC decreases the ratio of BTG to lagged total assets with 14.34% for firms with negative marginal net benefits of corporate tax avoidance. Moreover, the fourth PCSE model shows a positive interaction effect between TSEC, BI, and LTAA. The coefficient suggests that the ratio of residual BTG to lagged total assets increases with 0.001% when the interaction term increases with one unit. This effect is significant at the

1% significance level, which **supports hypothesis 2a**. Furthermore, the fourth PCSE model shows a negative interaction effect between TSEC, BI, and HTAA. The coefficient suggests that the ratio of residual BTG to lagged total assets decreases with 0.007% when the interaction term increases with one unit. This effect is significant at the 1% significance level, which **supports hypothesis 2b**. The results of the fourth PCSE model are used to answer the two research questions, because this model uses the most accurate measure of corporate tax avoidance. Therefore, hypothesis 1a, 1b, 2a, and 2b are supported based on the results of the fourth PCSE model.

4.3. Robustness Tests

The results of the first robustness test are provided in Table 3. The only difference with the PCSE models in the main analysis is that the dummy equal to 1 in a firm-year when the corporate tax avoidance measure is in the upper tercile (corporate tax avoidance has negative marginal net benefits) is replaced by a dummy equal to 1 when pretax accounting income scaled by total assets in a firm-year is in the lower tercile of the distribution. Besides, the dummy equal to 1 in a firm-year when the corporate tax avoidance measure is in the lower tercile (corporate tax avoidance has positive marginal net benefits) is replaced by a dummy equal to 1 when pretax accounting income scaled by total assets in a firm-year is in the upper tercile of the distribution. In other words, the LTAA and HTAA variable are measured differently.

All four models in Table 3 have a similar R^2 as their counterparts in the main analysis. The PCSE models with the ETR and the LTER as the dependent variable are respectively provided in column 1 and 2 of Table 3. The results of both models lead to the conclusion that **none of the hypotheses can be supported**. The PCSE models with the BTG scaled by lagged total assets and the residual BTG scaled by lagged total assets as the dependent variable are respectively provided in column 3 and 4 of Table 3. The results of both models lead to the conclusion that **all hypotheses can be supported**. In contrast with the PCSE model in Table 2 in which the BTG scaled by lagged total assets functions as the dependent variable, the related robustness test model in column 3 of Table 3 leads to the support of hypothesis 1b. The PCSE model in Table 2 in which the residual BTG scaled by lagged total assets functions as the dependent variable leads to the same conclusion as the related robustness test model in column 4 of Table 3, i.e., support of all hypotheses. Given that the residual BTG scaled by lagged total assets provides the most accurate measure of corporate tax avoidance, the first robustness test leads to the same conclusion as the main analysis.

Table 3: The four PCSE models that function as the first robustness test and estimate the impact of total senior executive compensation on corporate tax avoidance of European publicly listed firms. All models correct for serial correlation, cross-sectional correlation, and heteroskedasticity. Firm and industry-year fixed effects are included in each model but left out in the table for ease of exposition. The effective tax rate (ETR), the long-term cash effective tax rate (LTER), the ratio of the book-tax-gap to lagged total assets, and the ratio of the residual book-tax-gap to lagged total assets function as the dependent variable in respectively model 1, 2, 3, and 4. ***, **, * denote significance at the 1, 5, and 10% level, respectively. Standard errors are in parenthesis. The first PCSE model also corrects for endogeneity by using the 2SLS method as described in section 3.6.1.

VARIABLES	PCSE (1) ETR	PCSE (2) LTER	PCSE (3) BTG / lagged assets	PCSE (4) Residual BTG / lagged assets
TSEC	0.00101	-0.00229	-0.00012	-0.00005
	(0.00551)	(0.00198)	(0.00020)	(0.00027)
BI	-0.00025	0.00031	-0.00003	-0.00017*
	(0.00086)	(0.00095)	(0.00005)	(0.00009)
TSEC*BI	0.00001	-0.00003	0.000002	0.00001
	(0.00008)	(0.00003)	(0.000003)	(0.00004)
TSEC*LTAA	-0.00060	-0.00162	0.00010***	0.00208***
	(0.00599)	(0.00215)	(0.00002)	(0.00025)
TSEC*BI*LTAA	-0.000003	0.00002	0.00003***	0.00001***
	(0.00010)	(0.00003)	(0.000003)	(0.000004)
TSEC*HTAA	0.00144	0.00232	-0.00013***	-0.00047*
	(0.00556)	(0.00196)	(0.00002)	(0.00026)
TSEC*BI*HTAA	0.00002	0.00003	-0.00002**	-0.00001**
	(0.00008)	(0.00003)	(0.00001)	(0.000004)
Ln(assets)	-0.15583**	-0.03248	0.01797***	-0.06262***
	(0.06486)	(0.04336)	(0.00377)	(0.00850)
Liabilities/assets	0.15411	0.13603*	-0.06596***	-0.04234
	(0.23237)	(0.07905)	(0.01417)	(0.03281)
Net income/assets	0.39040	-0.03161	0.39473***	0.39058***
	(0.25754)	(0.08915)	(0.03182)	(0.09388)
New investments	0.06992	0.03455	-0.00332	0.05621***
	(0.05224)	(0.02892)	(0.00399)	(0.00770)
Constant	2.26959***	0.39754	-0.24994***	0.73222***
	(0.86482)	(0.26794)	(0.04406)	(0.06509)
Observations	5805	5805	5805	5805
Number of firms	387	387	387	387
Firm FE	YES	YES	YES	YES
Industry-year FE	YES	YES	YES	YES
R-squared	0.0976	0.1371	0.4715	0.7780

The results of the second robustness test are provided in Table 4. The first difference with the PCSE models in the main analysis is that the total senior executive compensation (TSEC) variable is replaced by a variable that measures the total compensation of the top-five-paid senior executives each year. The second difference is that for 24 firms data on BoardEx were unavailable or insufficient regarding the compensation of the top-five-paid executives. All four models have a similar R^2 as their counterparts in the main analysis. The PCSE models with the ETR and the LTER as the dependent variable are respectively provided in column 1 and 2 of

Table 4. The results of both models lead again to the conclusion that **none of the hypotheses can be supported**. The PCSE models with the BTG scaled by lagged total assets and the residual BTG scaled by lagged total assets as the dependent variable are respectively provided in column 3 and 4 of Table 4. The results of both models lead again to the conclusion that **all hypotheses can be supported**.

Table 4: The four PCSE models that function as the second robustness test and estimate the impact of total senior executive compensation on corporate tax avoidance of European publicly listed firms. TSEC is measured as the total compensation of the top-five-paid senior executives in a firm-year. All models correct for serial correlation, cross-sectional correlation, and heteroskedasticity. Firm and industry-year fixed effects are included in each model but left out in the table for ease of exposition. The effective tax rate (ETR), the long-term cash effective tax rate (LTER), the ratio of the book-tax-gap to lagged total assets, and the ratio of the residual book-tax-gap to lagged total assets function as the dependent variable in respectively model 1, 2, 3, and 4. ***, **, * denote significance at the 1, 5, and 10% level, respectively. Standard errors are in parenthesis.

VARIABLES	PCSE (1) ETR	PCSE (2) LTER	PCSE (3) BTG / lagged assets	PCSE (4) Residual BTG / lagged assets
TSEC	-0.00211	-0.00065	-0.00020	0.00004
	(0.00236)	(0.00110)	(0.00079)	(0.00016)
BI	-0.00067	0.00003	-0.00006	-0.00014
	(0.00134)	(0.00065)	(0.00005)	(0.00009)
TSEC*BI	0.00021	-0.00004	0.000002	0.000002
	(0.00021)	(0.00009)	(0.00001)	(0.00001)
TSEC*LTAA	-0.00400	-0.00254	0.00247*	0.00391**
	(0.01477)	(0.00531)	(0.00138)	(0.00175)
TSEC*BI*LTAA	0.00024	0.00012	0.00001***	0.00002***
	(0.00221)	(0.00080)	(0.000002)	(0.000004)
TSEC*HTAA	-0.00327	-0.00109	-0.00023***	-0.00028*
	(0.00730)	(0.00196)	(0.00002)	(0.00017)
TSEC*BI*HTAA	-0.00009	0.000004	-0.00002**	-0.00001*
	(0.00025)	(0.00009)	(0.00001)	(0.00001)
Ln(assets)	-0.15658**	-0.02985	0.01840***	-0.06313***
	(0.06449)	(0.04331)	(0.00373)	(0.00848)
Liabilities/assets	0.15004	0.13119*	-0.06701***	-0.04281
	(0.23134)	(0.07941)	(0.01412)	(0.03257)
Net income/assets	0.41026	-0.00916	0.39887***	0.39215***
	(0.25508)	(0.08439)	(0.03213)	(0.09507)
New investments	0.06694	0.03262	-0.00354	0.05536***
	(0.05171)	(0.02867)	(0.00397)	(0.00764)
Constant	2.30063***	0.40176	-0.16289***	0.73387***
	(0.86501)	(0.26486)	(0.02694)	(0.06542)
Observations	5445	5445	5445	5445
Number of firms	363	363	363	363
Firm FE	YES	YES	YES	YES
Industry-year FE	YES	YES	YES	YES
R-squared	0.0977	0.1366	0.4750	0.7820

5. Discussion

The main analysis and robustness checks indicated that total senior executive compensation positively (negatively) influences corporate tax avoidance of European publicly listed firms when the marginal net benefits of corporate tax avoidance are positive (negative). Besides, the results show that the positive relationship and negative relationship between total senior executive compensation and corporate tax avoidance are strengthened by the proportion of strictly independent board members. This conclusion is based on the PCSE models with the residual book-tax-gap scaled by lagged total assets as the dependent variable, which has been identified as the most accurate measure of corporate tax avoidance (Desai & Dharmapala, 2006; Wang et al., 2020). The residual book-tax-gap namely controls for the effect of earnings management on the book-tax-gap and is not influenced by changes in statutory tax rates. That the PCSE models with the ETR, LTER, and book-tax-gap scaled by lagged total assets showed less significant or even insignificant results regarding the hypotheses and the control variables can be explained by the fact that these variables are a far noisier measure of corporate tax avoidance relative to the residual book-tax-gap.

Thus, the results provide evidence for the rationale that better functioning corporate governance mechanisms (higher total senior executive compensation) lead to better incentive alignment between managers and shareholders and consequently lead to more corporate tax avoidance, given that the firm has underinvested in corporate tax avoidance (Armstrong et al., 2015; Wang et al., 2020). In other words, more corporate tax avoidance is beneficial for shareholders when the marginal net benefits of corporate tax avoidance are positive (Armstrong et al., 2015). The results also provide evidence for the rationale that better functioning corporate governance mechanisms lead to less corporate tax avoidance when incremental corporate tax avoidance is likely to have more costs – i.e., costs of lower reputation, litigation, and transfer pricing – than benefits (tax cost savings). Besides, the results are also in line with Armstrong et al. (2015) who state that board independence mitigates relatively high or low levels of corporate tax avoidance, because more independent boards recognize the potential (opportunity) costs of relatively low or high corporate tax avoidance positions.

The study's conclusion contradicts with previous studies that hypothesize either a positive effect of compensation on corporate tax avoidance (Ansar et al., 2021) or a negative effect (Desai & Dharmapala, 2006; Gill & Arora, 2022; Halioui et al., 2016). However, the study creates consensus in the finance and accounting literature about the influence of total senior executive compensation on corporate tax avoidance – which depends on the marginal

net benefits of corporate tax avoidance – and how this relationship is moderated by board independence. In a nutshell, the study has provided evidence for the rationale that corporate governance mechanisms – i.e., total senior executive compensation and strictly independent board members – alleviate agency problems at extreme levels of tax avoidance. This means that better functioning governance mechanisms lead to a more optimal level of tax avoidance with respect to firm value and shareholder wealth in the long run (Armstrong et al., 2015). Another difference from previous studies is that the effect of total senior executive compensation is investigated and not solely equity compensation (Armstrong et al., 2015; Seidman & Stomberg, 2017). Besides, this study shows that the proportion of strictly independent board members strengthens the relation between total senior executive compensation and corporate tax avoidance when corporate tax avoidance has negative or positive marginal net benefits, whereas Armstrong et al. (2015) only investigated the influence of board independence on corporate tax avoidance across the corporate tax avoidance distribution.

6. Conclusion

This study aims to answer the following research question: What is the influence of total senior executive compensation on corporate tax avoidance of European publicly listed firms? The results of the most valid PCSE model – in which the residual book-tax-gap scaled by lagged total assets functions as the dependent variable – indicate that total senior executive compensation positively (negatively) influences corporate tax avoidance when the marginal net benefits of corporate tax avoidance activity are positive (negative). This is in line with Armstrong et al. (2015) who propose that corporate governance mechanisms alleviate agency problems between management and shareholders at extreme levels of corporate tax avoidance activity. In other words, better functioning corporate governance mechanisms lead to less (more) corporate tax avoidance when incremental corporate tax avoidance is likely to have more (less) costs than benefits. Two different robustness PCSE models, in which the residual book-tax-gap scaled by lagged total assets functions as the dependent variable, led to the same conclusion as the related PCSE model in the main analysis.

Besides, the study focusses on the following sub question: What is the influence of the proportion of strictly independent board members on the relation between total senior executive compensation and corporate tax avoidance of European publicly listed firms? In line with the same rationale that corporate governance mechanisms alleviate agency problems at extreme levels of corporate tax avoidance activity, the results of the most valid PCSE model also indicate that the proportion of strictly independent board members strengthens the positive and negative relationship – respectively when the marginal net benefits of corporate tax avoidance are positive and negative – between total senior executive compensation and corporate tax avoidance. Again, two different robustness PCSE models, in which the residual book-tax-gap scaled by lagged total assets functions as the dependent variable, led to the same conclusion as the related PCSE model in the main analysis.

The sample to test the four hypotheses consists of 387 European publicly listed firms from 15 European countries and annual data from 2007 to 2021. In total, twelve different panel-corrected standard error (PCSE) models are used to test the hypotheses. All PCSE models control for the proportion of strictly independent board members, firm size, leverage, profitability, new investments made, firm fixed effects, and industry-year fixed effects. Besides, all PCSE models account for serial correlation, heteroskedasticity, and cross-sectional correlation of the residual. When needed, the models deal with endogeneity concerns.

The implications to research are threefold. Firstly, this study has created consensus in the literature about the influence of total senior executive compensation on corporate tax avoidance because the study shows that the effect of total senior executive compensation on corporate tax avoidance depends on the marginal net benefits of corporate tax avoidance. Secondly, this study investigated the effect of total senior executive compensation, whereas previous research has investigated only compensation components or total compensation of some senior executives. Therefore, this study lays a foundation for subsequent research about the effect of total senior executive compensation on corporate outcomes, especially corporate outcomes with an optimal equilibrium from a shareholder perspective. Thirdly, the answer to the sub question provides researchers with evidence that strictly independent board members strengthen the relation between total senior executive compensation and corporate tax avoidance, given that corporate tax avoidance has positive or negative marginal net benefits.

The implications to practice are threefold. From a shareholder perspective, it is relevant to study corporate tax avoidance because corporate tax avoidance leads to both benefits and (potential) costs. The study's findings implicate that shareholders should demand more independent board members and higher senior executive compensation to bring corporate tax avoidance to its optimal societal level. The study namely indicates that independent board members and senior executive compensation are effective in influencing corporate outcomes that are beneficial for shareholders. From an accounting and auditing perspective, the study's results inform that the level of total senior executive compensation and the proportion of strictly independent board members should be increased (decreased) for firms in which low (high) corporate tax avoidance activity is likely. Donohoe & Knechel (2014) namely found that corporate tax avoidance is positively related with audit fees, possibly due to increased reputational risk of auditors when corporate tax avoidance is relatively high. On top of that, the study's results provide tax authorities with indicators of strong corporate tax avoidance activity, improving monitoring of firm behavior.

Despite the conclusion that hypothesis 1a, 1b, 2a, and 2b can be supported, the study has some limitations. The first shortcoming is that 61.49% of the sample size consists of European publicly listed firms from France, Germany, and the UK (see Appendix 1) and that 52.98% of the sample size consists of firms from the financial, industrial, and consumer cyclical sector (see Appendix 2). A more equally distributed sample over the European countries and across the industries could lead to better generalization of the study's findings to the population of all European publicly listed firms. In other words, a more equally distributed sample size would be more favorable for the analysis of the impact of total senior executive

compensation on corporate tax avoidance of European publicly listed firms, because this naturally controls for country level and industry level characteristics. The second shortcoming is that all measures of corporate tax avoidance contain noise, i.e., not all variances in the measures are due to changes in corporate tax avoidance activities. This lowers the internal validity of the results because it is uncertain that the operationalized variable solely measures the theoretical construct. A suggestion for future research is to create more precise operationalizations of corporate tax avoidance. For example, scholars could expand the methodology of Desai & Dharmapala (2006) and regress the book-tax-gap not only on total accruals, but also on differences in tax laws and differences in generally accepted accounting principles (GAAP) (Graham et al., 2012). The third shortcoming is that accounting-based measurements of corporate tax avoidance will always be noisy measures to a certain extent, because corporate tax avoidance, tax evasion, and the vague area between these two concepts cannot be separated by accounting measures. Therefore, future research is suggested to investigate the tax reports of firms thoroughly and develop more precise non-accounting-based measurement methods of corporate tax avoidance. The fourth shortcoming is that the study uses dummy variables to indicate whether the marginal net benefits of corporate tax avoidance are positive or negative in a specific firm-year. Positive (negative) marginal net benefits are assumed when a variable such as pretax accounting income scaled by total assets is in the upper (lower) tercile of its distribution. This measurement method of the marginal net benefits of corporate tax avoidance is common in the accounting and finance literature, though it lacks precision. Therefore, future research is suggested to construct variables that measure the marginal net benefits more precisely. The fifth shortcoming is that the study only focusses on European publicly listed firms, worsening generalization to non-European firms and firms with other ownership structures. Therefore, future research should also investigate whether the found relationships also hold in a sample of non-European and private firms. The last shortcoming is that prior research – including this study – has not focused on how tax decisions are made within the firm. This includes the extent to which senior executives make tax decisions themselves or create a corporate culture in which tax avoidance is socially accepted. Besides, research has not investigated which manager-specific characteristics influence corporate tax avoidance. Therefore, future research should study these internal decision-making mechanisms, preferably with qualitative research designs such as case studies.

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8. Appendices

Appendix 1: Overview of the number of firms per European country, percentage of firms per European country, and cumulative percentages.

Country of Exchange	Firms	Percent	Cum.
Austria	6	1.55	1.55
Belgium	7	1.81	3.36
Denmark	16	4.13	7.49
Finland	18	4.65	12.14
France	47	12.14	24.29
Germany	43	11.11	35.40
Ireland; Republic of	5	1.29	36.69
Italy	3	0.78	37.47
Netherlands	20	5.17	42.64
Norway	13	3.36	45.99
Portugal	1	0.26	46.25
Spain	4	1.03	47.29
Sweden	33	8.53	55.81
Switzerland	23	5.94	61.76
United Kingdom	148	38.24	100.00
Total	387	100.00	

Appendix 2: Overview of the number of firms per industry, percentage of firms per industry, and cumulative percentages.

Industry	Firms	Percent	Cum.
Basic Materials	42	10.85	10.85
Consumer Cyclicals	65	16.80	27.65
Consumer Non-Cyclicals	33	8.53	36.18
Energy	16	4.13	40.31
Financials	57	14.73	55.04
Healthcare	22	5.68	60.72
Industrials	83	21.45	82.17
Real Estate	17	4.39	86.56
Technology	38	9.82	96.38
Utilities	14	3.62	100.00
Total	387	100.00	

Appendix 3: The results of the Harris-Tzavalis test of stationarity for the dependent variable and independent variables of the first PCSE model (Firms=387; T=15). Senior executive compensation is instrumented using the 2SLS method.

Variable	Harris-Tzavalis Statistic	P-value	Number of panels	Number of periods
ETR	-0.1221	0.0000	387	15
Total senior executive compensation	0.2939	0.0000	387	15
Strictly independent board members (%)	0.5739	0.0000	387	15
Interaction TSEC and BI	0.3755	0.0000	387	15
Interaction TSEC and low tax avoidance activity	0.0555	0.0000	387	15
Interaction TSEC and high tax avoidance activity	0.0949	0.0000	387	15
Interaction TSEC, BI, and low tax avoidance activity	0.0357	0.0000	387	15
Interaction TSEC, BI, and high tax avoidance activity	0.1246	0.0000	387	15
Natural logarithm of total assets	0.7862	0.0000	387	15
Ratio of total liabilities to total assets	0.7743	0.0000	387	15
Ratio of net income after taxes to total assets	0.3711	0.0000	387	15
Ratio of new investments to lagged total assets	0.5497	0.0000	387	15

Appendix 4: The results of the Harris-Tzavalis test of stationarity for the dependent variable and independent variables of the second PCSE model (Firms=387; T=15).

Variable	Harris-Tzavalis Statistic	P-value	Number of panels	Number of periods
LTER	0.6420	0.0000	387	15
Total senior executive compensation	-0.0312	0.0000	387	15
Strictly independent board members (%)	0.5739	0.0000	387	15
Interaction TSEC and BI	-0.0313	0.0000	387	15
Interaction TSEC and low tax avoidance activity	0.1788	0.0000	387	15
Interaction TSEC and high tax avoidance activity	-0.0579	0.0000	387	15
Interaction TSEC, BI, and low tax avoidance activity	0.3153	0.0000	387	15
Interaction TSEC, BI, and high tax avoidance activity	-0.0593	0.0000	387	15
Natural logarithm of total assets	0.7862	0.0000	387	15
Ratio of total liabilities to total assets	0.7743	0.0000	387	15
Ratio of net income after taxes to total assets	0.3711	0.0000	387	15
Ratio of new investments to lagged total assets	0.5497	0.0000	387	15

Appendix 5: The results of the Harris-Tzavalis test of stationarity for the dependent variable and independent variables of the third PCSE model (Firms=387; T=15).

Variable	Harris-Tzavalis Statistic	P-value	Number of panels	Number of periods
Ratio of book-tax-gap to lagged total assets	0.1484	0.0000	387	15
Total senior executive compensation	-0.0312	0.0000	387	15
Strictly independent board members (%)	0.5739	0.0000	387	15
Interaction TSEC and BI	-0.0313	0.0000	387	15
Interaction TSEC and low tax avoidance activity	-0.0708	0.0000	387	15
Interaction TSEC and high tax avoidance activity	-0.0550	0.0000	387	15
Interaction TSEC, BI, and low tax avoidance activity	-0.0724	0.0000	387	15
Interaction TSEC, BI, and high tax avoidance activity	-0.0536	0.0000	387	15
Natural logarithm of total assets	0.7862	0.0000	387	15
Ratio of total liabilities to total assets	0.7743	0.0000	387	15
Ratio of net income after taxes to total assets	0.3711	0.0000	387	15
Ratio of new investments to lagged total assets	0.5497	0.0000	387	15

Appendix 6: The results of the Harris-Tzavalis test of stationarity for the dependent variable and independent variables of the fourth PCSE model (Firms=387; T=15).

Variable	Harris-Tzavalis Statistic	P-value	Number of panels	Number of periods
Ratio of residual book-tax-gap to lagged total assets	0.5192	0.0000	387	15
Total senior executive compensation	-0.0312	0.0000	387	15
Strictly independent board members (%)	0.5739	0.0000	387	15
Interaction TSEC and BI	-0.0313	0.0000	387	15
Interaction TSEC and low tax avoidance activity	-0.0099	0.0000	387	15
Interaction TSEC and high tax avoidance activity	0.0268	0.0000	387	15
Interaction TSEC, BI, and low tax avoidance activity	-0.0185	0.0000	387	15
Interaction TSEC, BI, and high tax avoidance activity	0.0463	0.0000	387	15
Natural logarithm of total assets	0.7862	0.0000	387	15
Ratio of total liabilities to total assets	0.7743	0.0000	387	15
Ratio of net income after taxes to total assets	0.3711	0.0000	387	15
Ratio of new investments to lagged total assets	0.5497	0.0000	387	15

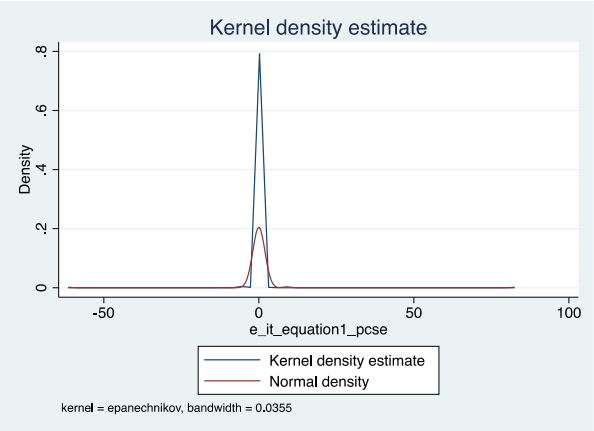
Appendix 7: The four panel models that estimate the impact of total senior executive compensation on corporate tax avoidance of European publicly listed firms. Firm and industry-year fixed effects are included in each model but are left out in the table for ease of exposition. The effective tax rate (ETR), the long-term cash effective tax rate (LTER), the ratio of the book-tax-gap to lagged total assets, and the ratio of the residual book-tax-gap to lagged total assets function as the dependent variable in respectively model 1, 2, 3, and 4. ***, **, * denote significance at the 1, 5, and 10% level, respectively. Standard errors are in parenthesis.

VARIABLES	OLS (1) ETR	OLS (2) LTER	OLS (3) BTG / lagged assets	OLS (4) Residual BTG / lagged assets
TSEC	0.00019	-0.00464	-0.00011	-0.00010
	(0.00726)	(0.00340)	(0.00010)	(0.00033)
BI	-0.00013	-0.00192**	-0.00009**	-0.00033***
	(0.00213)	(0.00094)	(0.00005)	(0.00008)
TSEC*BI	0.0000002	0.00010	0.000002	0.00002
	(0.00013)	(0.00006)	(0.000002)	(0.00005)
TSEC*LTAA	0.00445	0.00527	0.00239***	0.00075***
	(0.00831)	(0.00381)	(0.00027)	(0.00035)
TSEC*BI*LTAA	-0.00005	0.00005	0.00003***	0.00001***
	(0.00013)	(0.00006)	(0.000004)	(0.000005)
TSEC*HTAA	-0.00267	-0.00498	-0.00012	-0.00215***
	(0.01089)	(0.00436)	(0.00021)	(0.00069)
TSEC*BI*HTAA	0.000008	0.00003	-0.000004	-0.00006***
	(0.00017)	(0.00007)	(0.000005)	(0.00001)
Ln(assets)	-0.15492	-0.09120**	0.015875***	-0.07732***
	(0.09456)	(0.042236)	(0.00200)	(0.00364)
Liabilities/assets	0.15158	0.21697	-0.06010***	-0.02913***
	(0.29841)	(0.13327)	(0.00631)	(0.01148)
Net income/assets	0.38160	-0.06229	0.35221***	0.29501***
	(0.42671)	(0.19051)	(0.00903)	(0.01648)
New investments	0.06701	0.03783	-0.006207*	0.04106***
	(0.16119)	(0.07199)	(0.00341)	(0.00619)
Constant	1.54400*	1.00508**	-0.12571***	0.79211***
	(0.92826)	(0.41469)	(0.01964)	(0.03573)
Observations	5805	5805	5805	5805
Number of firms	387	387	387	387
Firm FE	YES	YES	YES	YES
Industry-year FE	YES	YES	YES	YES
R-squared	0.0402	0.0594	0.3393	0.2520

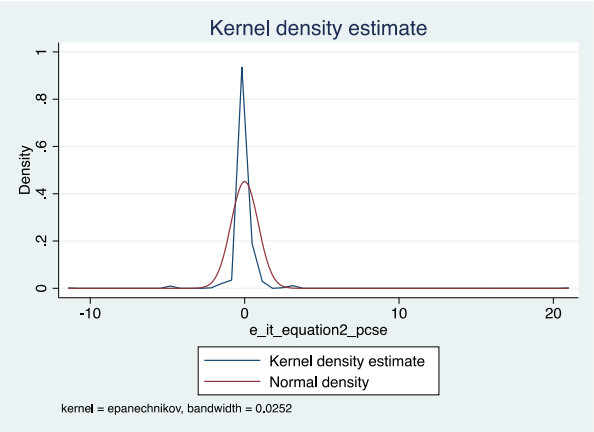
Appendix 8: P-values of the tests for serial correlation (Wooldridge, 2002), heteroskedasticity (Breusch & Pagan, 1980), and cross-sectional correlation (Frees, 1995) in the OLS fixed effects model that estimates Equation 4 (ETR as dependent variable) and the related conclusions. The conclusions are the same in the other OLS fixed effects models (LTER, BTG scaled by lagged total assets, and residual BTG scaled by lagged total assets as the dependent variable).

Test	**P-value**	**Conclusion**
Wooldridge serial correlation	0.0000	Residuals serially correlated
Frees heteroskedasticity	0.0000	Heteroskedastic residuals
Breusch-Pagan Lagrange multiplier cross-sectional correlation	0.0000	Cross-sectionally correlated residuals

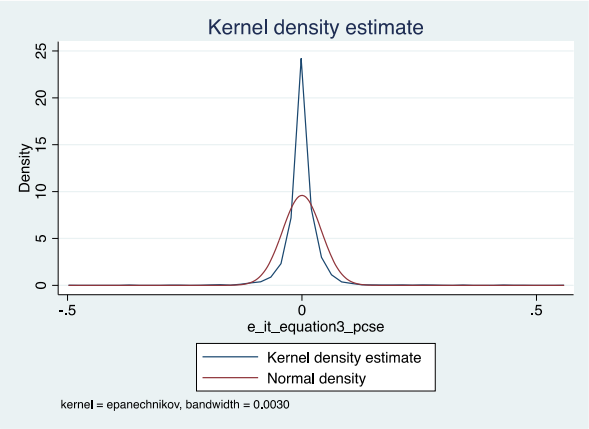
Appendix 9: The distribution of the residual of the first PCSE model (blue line), and the fitted normal distribution of the residual (red line) for comparison. The tests that are used state that the residual is normally distributed, thus the blue line (actual residual distribution) does not significantly differ from the red line (standard normal distribution).



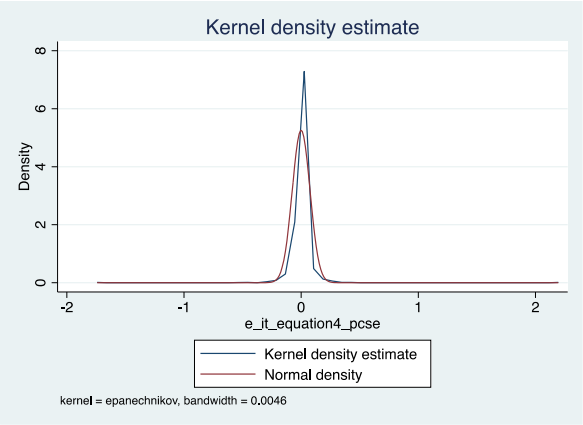
Appendix 10: The distribution of the residual of the second PCSE model (blue line), and the fitted normal distribution of the residual (red line) for comparison. The tests that are used state that the residual is normally distributed, thus the blue line (actual residual distribution) does not significantly differ from the red line (standard normal distribution).



Appendix 11: The distribution of the residual of the third PCSE model (blue line), and the fitted normal distribution of the residual (red line) for comparison. The tests that are used state that the residual is normally distributed, thus the blue line (actual residual distribution) does not significantly differ from the red line (standard normal distribution).



Appendix 12: The distribution of the residual of the fourth PCSE model (blue line), and the fitted normal distribution of the residual (red line) for comparison. The tests that are used state that the residual is normally distributed, thus the blue line (actual residual distribution) does not significantly differ from the red line (standard normal distribution).



Appendix 13: The r-squared, tolerance, and variance inflation factor (VIF) to investigate multicollinearity of the eleven independent variables of the first PCSE model in which the ETR functions as the dependent variable. The VIFs are below ten, indicating that multicollinearity is not a problem. Senior executive compensation is instrumented using the 2SLS method. Generated with collin command.

Variable	**R-squared**	**Tolerance (1-R^2)**	**VIF (1/(1-R^2))**
Total senior executive compensation	0.8488	0.1512	6.61
Strictly independent board members (%)	0.6745	0.3255	3.07
Interaction TSEC and BI	0.8542	0.1458	6.86
Interaction TSEC and low tax avoidance activity	0.8352	0.1648	6.07
Interaction TSEC and high tax avoidance activity	0.8249	0.1751	5.71
Interaction TSEC, BI, and low tax avoidance activity	0.8371	0.1629	6.14
Interaction TSEC, BI, and high tax avoidance activity	0.8278	0.1722	5.81
Natural logarithm of total assets	0.7431	0.2569	3.89
Ratio of total liabilities to total assets	0.1327	0.8673	1.15
Ratio of net income after taxes to total assets	0.1345	0.8655	1.16
Ratio of new investments to lagged total assets	0.0335	0.9665	1.03

Appendix 14: The r-squared, tolerance, and variance inflation factor (VIF) to investigate multicollinearity of the eleven independent variables of the second PCSE model in which the LTER functions as the dependent variable. The VIFs are below ten, indicating that multicollinearity is not a problem. Generated with collin command.

Variable	**R-squared**	**Tolerance (1-R^2)**	**VIF (1/(1-R^2))**
Total senior executive compensation	0.8922	0.1078	9.28
Strictly independent board members (%)	0.2718	0.7282	1.37
Interaction TSEC and BI	0.8950	0.1050	9.52
Interaction TSEC and low tax avoidance activity	0.8027	0.1973	5.07
Interaction TSEC and high tax avoidance activity	0.8953	0.1047	9.55
Interaction TSEC, BI, and low tax avoidance activity	0.8040	0.1960	5.10
Interaction TSEC, BI, and high tax avoidance activity	0.8964	0.1036	9.65
Natural logarithm of total assets	0.2547	0.7453	1.34
Ratio of total liabilities to total assets	0.1217	0.8783	1.14
Ratio of net income after taxes to total assets	0.0707	0.9293	1.08
Ratio of new investments to lagged total assets	0.0324	0.9676	1.03

Appendix 15: The r-squared, tolerance, and variance inflation factor (VIF) to investigate multicollinearity of the eleven independent variables of the third PCSE model in which the BTG scaled by lagged total assets functions as the dependent variable. The VIFs are below ten, indicating that multicollinearity is not a problem. Generated with collin command.

Variable	**R-squared**	**Tolerance (1-R^2)**	**VIF (1/(1-R^2))**
Total senior executive compensation	0.8825	0.1175	8.51
Strictly independent board members (%)	0.3148	0.6852	1.46
Interaction TSEC and BI	0.8883	0.1117	8.95
Interaction TSEC and low tax avoidance activity	0.8958	0.1042	9.60
Interaction TSEC and high tax avoidance activity	0.8854	0.1146	8.73
Interaction TSEC, BI, and low tax avoidance activity	0.8962	0.1038	9.63
Interaction TSEC, BI, and high tax avoidance activity	0.8861	0.1139	8.78
Natural logarithm of total assets	0.2164	0.7836	1.28
Ratio of total liabilities to total assets	0.1254	0.8746	1.14
Ratio of net income after taxes to total assets	0.0658	0.9342	1.07
Ratio of new investments to lagged total assets	0.0333	0.9667	1.03

Appendix 16: The r-squared, tolerance, and variance inflation factor (VIF) to investigate multicollinearity of the eleven independent variables of the fourth PCSE model in which the residual BTG scaled by lagged total assets functions as the dependent variable. The VIFs are below ten, indicating that multicollinearity is not a problem. Generated with collin command.

Variable	**R-squared**	**Tolerance (1-R^2)**	**VIF (1/(1-R^2))**
Total senior executive compensation	0.8918	0.1082	9.24
Strictly independent board members (%)	0.3203	0.6797	1.47
Interaction TSEC and BI	0.8958	0.1042	9.60
Interaction TSEC and low tax avoidance activity	0.8936	0.1064	9.40
Interaction TSEC and high tax avoidance activity	0.8388	0.1612	6.20
Interaction TSEC, BI, and low tax avoidance activity	0.8949	0.1051	9.51
Interaction TSEC, BI, and high tax avoidance activity	0.8367	0.1633	6.12
Natural logarithm of total assets	0.2202	0.7798	1.28
Ratio of total liabilities to total assets	0.1241	0.8759	1.14
Ratio of net income after taxes to total assets	0.0746	0.9254	1.08
Ratio of new investments to lagged total assets	0.0328	0.9672	1.03

Appendix 17: The Pearson correlation coefficient of each independent variable with the residual of the first PCSE model. All correlation coefficients are between -0.1 and 0.1, indicating very weak or absent relationship between the independent variables and the residual of the first PCSE model (ETR as dependent variable).

Independent variable	**Correlation coefficient with the residual**
Total senior executive compensation	-0.0002
Strictly independent board members (%)	-0.0004
Interaction TSEC and BI	-0.0005
Interaction TSEC and low tax avoidance activity	-0.0005
Interaction TSEC and high tax avoidance activity	0.0003
Interaction TSEC, BI, and low tax avoidance activity	-0.0006
Interaction TSEC, BI, and high tax avoidance activity	0.0002
Natural logarithm of total assets	-0.0001
Ratio of total liabilities to total assets	-0.0001
Ratio of net income after taxes to total assets	-0.0000
Ratio of new investments to lagged total assets	-0.0001

Appendix 18: The Pearson correlation coefficient of each independent variable with the residual of the second PCSE model. All correlation coefficients are between -0.1 and 0.1, indicating very weak or absent relationship between the independent variables and the residual of the second PCSE model (LTER as dependent variable).

Independent variable	**Correlation coefficient with the residual**
Total senior executive compensation	-0.0002
Strictly independent board members (%)	-0.0004
Interaction TSEC and BI	-0.0005
Interaction TSEC and low tax avoidance activity	-0.0005
Interaction TSEC and high tax avoidance activity	0.0003
Interaction TSEC, BI, and low tax avoidance activity	-0.0006
Interaction TSEC, BI, and high tax avoidance activity	0.0002
Natural logarithm of total assets	-0.0001
Ratio of total liabilities to total assets	-0.0001
Ratio of net income after taxes to total assets	-0.0000
Ratio of new investments to lagged total assets	-0.0001

Appendix 19: The Pearson correlation coefficient of each independent variable with the residual of the third PCSE model. All correlation coefficients are between -0.1 and 0.1, indicating very weak or absent relationship between the independent variables and the residual of the third PCSE model (BTG scaled by lagged total assets as dependent variable).

Independent variable	**Correlation coefficient with the residual**
Total senior executive compensation	-0.0004
Strictly independent board members (%)	0.0002
Interaction TSEC and BI	0.0001
Interaction TSEC and low tax avoidance activity	-0.0029
Interaction TSEC and high tax avoidance activity	0.0055
Interaction TSEC, BI, and low tax avoidance activity	-.0021
Interaction TSEC, BI, and high tax avoidance activity	0.0052
Natural logarithm of total assets	-0.0026
Ratio of total liabilities to total assets	0.0061
Ratio of net income after taxes to total assets	-0.0302
Ratio of new investments to lagged total assets	-0.0078

Appendix 20: The Pearson correlation coefficient of each independent variable with the residual of the fourth PCSE model. All correlation coefficients are between -0.1 and 0.1, indicating very weak or absent relationship between the independent variables and the residual of the fourth PCSE model (residual BTG scaled by lagged total assets as dependent variable).

Independent variable	**Correlation coefficient with the residual**
Total senior executive compensation	0.0027
Strictly independent board members (%)	0.0018
Interaction TSEC and BI	0.0041
Interaction TSEC and low tax avoidance activity	0.0018
Interaction TSEC and high tax avoidance activity	-0.0011
Interaction TSEC, BI, and low tax avoidance activity	0.0025
Interaction TSEC, BI, and high tax avoidance activity	-0.0037
Natural logarithm of total assets	-0.0024
Ratio of total liabilities to total assets	0.0112
Ratio of net income after taxes to total assets	-0.0469
Ratio of new investments to lagged total assets	-0.0248