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A study on corporate tax avoidance

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To Nanda

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Chapter 1 A theoretical framework for corporate tax avoidance

1.1 Overview

Corporate tax avoidance represents a multifaceted phenomenon at the intersection of finance, governance, and regulation, encompassing a continuum of strategies from legal tax minimization to aggressive practices like tax sheltering. This study investigates the determinants, consequences, and implications of corporate tax avoidance, offering a comprehensive exploration of how firms navigate the complex interplay between financial objectives, regulatory environments, and reputational concerns.

Structured into five chapters, the research examines how tax avoidance strategies interact with firm characteristics, regulatory frameworks, and executive incentives. This chapter introduces the topic of corporate tax avoidance and provides a general framework. Existing literature describes tax avoidance as a continuum of tax planning strategies, ranging from perfectly legal tax reduction activities to abusive tax avoidance such as tax sheltering. Policymakers worldwide have taken coordinated actions and enacted anti-avoidance rules to avoid losing tax revenues and mitigate the incentives for profit-shifting international profit shifting through tax base–tax-broadening reforms. While firms, on average, appear to engage in tax avoidance activities to diminish their tax burden, the empirical evidence also shows that the extent to which firms engage in tax avoidance varies

considerably, with some firms not taking full advantage of the tax avoidance opportunities.

Firms often face a trade-off between the financial benefits of tax savings and the potential costs associated with aggressive strategies, such as regulatory scrutiny, reputational damage, and financial instability. This tension explains the "undersheltering puzzle", where firms deliberately avoid fully exploiting tax-saving opportunities despite potential financial advantages. Prior literature has focused on various determinants explaining tax avoidance outcomes and their consequences.

The research also delves into the relationship between tax avoidance and risk, identifying characteristics of firms that successfully balance low tax burdens with minimal exposure to tax-related uncertainties. Larger firms with stable earnings and significant foreign operations often achieve this balance, demonstrating the importance of strategic planning and adaptability in tax management.

A key focus is the influence of taxation on corporate financing decisions, as illustrated by Italy's 2008 thin capitalization rule. This case reveals how tax policy reforms drive adjustments in capital structure and tax strategies, showcasing firms' resilience and responsiveness to regulatory changes. Moreover, the study examines the role of corporate governance, and in particular of executive incentives, in shaping tax strategies. Inside debt such as pension plans and deferred compensation held by executives aligns managerial interests with debtholders, fostering conservative tax decisions, while equity-based compensation encourages aggressive tax avoidance, particularly in sectors like banking. This work underscores the critical need for balanced governance and regulatory frameworks, offering valuable insights for policymakers and corporate leaders navigating the complexities of tax planning in an era of heightened public scrutiny and global economic integration.

1.2 A framework for corporate tax avoidance

Tax planning strategies, as outlined in Dowling (2014), play a significant role in the intersection of corporate financial management

and social responsibility. Corporations often engage in tax planning to minimize their tax liabilities, leveraging legal mechanisms such as transfer pricing, offshore tax shelters, and accounting manipulations. These strategies allow companies to shift profits to low-tax jurisdictions while recognizing expenses in high-tax regions, thereby reducing their overall tax burden. For instance, multinational corporations frequently exploit the complexity of international tax systems to achieve "stateless income," where profits are taxed in jurisdictions unrelated to the actual economic activities.

While these practices are often legal, they raise ethical and social concerns (Alexander & Menicacci, 2025). Previous research has positioned tax avoidance as a corporate social responsibility issue (Bird & Davis-Nozemack, 2018). From this viewpoint, tax avoidance is deemed socially irresponsible, conflicting with a firm's societal duties (Lanis & Richardson, 2012; Avi-Yonah, 2014; Dowling, 2014). Firms are seen as morally obligated to avoid such practices and align their tax compliance with the ethical and social expectations of stakeholders (Scheffer, 2013; Sikka, 2010). This perspective reinforces society's capacity to exert social pressure for conformity within a legitimized framework of corporate accountability.

Viewing taxation as part of corporate socially responsible policies stems from the belief that aggressive tax behaviors impose societal costs (Weisbach, 2002). Taxes play a critical role in ensuring macroeconomic stability, reducing inequality, and supporting the transition to a low-carbon economy (GRI, 2022). Accordingly, tax avoidance is incompatible with sound corporate social responsibility practices, as firms should refrain from unethical activities that harm society. By avoiding taxes, corporations not only deprive governments of revenue needed to fund these services but also shift the tax burden onto individuals and smaller businesses, exacerbating social inequality. This behavior, critics suggest, undermines public trust and the moral legitimacy of corporate operations.

On the other side of the argument, proponents of aggressive tax planning emphasize the fiduciary duty of corporations to maximize shareholder value. By minimizing tax liabilities, companies can allo-

cate more resources to innovation, employee wages, and shareholder returns, which they argue are also contributions to societal well-being. This perspective aligns with the "nexus of contracts" view of the firm (Eisenberg, 1998), where tax is treated as a cost to be minimized, much like any other business expense.

While tax avoidance and tax evasion are fundamentally different in their legal and ethical implications (Stiglitz, 1995), the two concepts often conflate. Tax avoidance refers to the strategic use of legal provisions within the tax code to minimize tax liabilities. This includes practices like postponing taxes, arbitraging across different tax brackets, or exploiting favorable tax treatments for specific income streams, such as capital gains. These actions, while reducing tax burdens, operate within the bounds of the law and are often justified as rational financial planning.

In contrast, tax evasion involves the illegal underreporting of income, inflating deductions, or other fraudulent activities to evade paying taxes owed. Unlike tax avoidance, tax evasion breaches legal obligations and constitutes a criminal offense. Stiglitz emphasizes that while tax avoidance exploits the complexities of tax systems, it challenges policymakers to address loopholes without criminalizing legitimate financial behavior, whereas tax evasion directly undermines the integrity of the tax system.

Tax evasion is a complex phenomenon that combines economic, psychological, and regulatory aspects. According to Allingham and Sandmo (1972), tax evasion is modeled as a decision under uncertainty, with tax compliance as the outcome choice determined by tax rates, the probability of detection and punishment, penalties, and risk-aversion as well as intrinsic motivations such as civic duty.

However, this model requires a high degree of risk aversion to explain the observed compliance rates, a point criticized by later studies. Skinner and Slemrod (1985) emphasize that tax evasion not only breaches horizontal and vertical equity but also creates economic inefficiencies, such as distorted resource allocation. They highlight that enforcement policies, such as severe penalties or increased monitoring, must balance costs and fairness. Bernasconi (1998) introduces the

concept of first-order risk aversion, which better explains compliance behavior compared to traditional models. The perceived excessive risk aversion may stem from overestimating the probability of being caught or from fear of uncertainty.

Since taxes are mandatory obligations rather than voluntary contributions, it is reasonable for corporations, like individuals, to structure their operations in a way that minimizes tax payments. To achieve this, companies engage in tax planning aimed at reducing their tax liabilities (commonly referred to as tax avoidance). However, successful tax planning requires careful attention to numerous factors.

To reduce tax liabilities and maximize after-tax profits, firms often face a trade-off between the benefits of tax savings and the costs associated with financial reporting. Publicly listed companies experience market pressure to report strong earnings to investors, leading managers to prioritize financial statement figures for various reasons. For example, executive compensation is frequently tied to accounting earnings. Similarly, lenders include bond covenants—based on metrics like debt-to-equity ratios, dividend restrictions as a percentage of retained earnings, current assets to liabilities, and interest coverage ratios—to address potential conflicts of interest between borrowers and lenders. Additionally, analysts and investors rely on accounting figures to value both equity and debt securities, meaning that reporting lower income could negatively impact stock prices and increase borrowing costs. Regulators also use these accounting figures to monitor and oversee firms, adding another layer of scrutiny for managers.

According to Scholes and Wolfson's (2014) framework, taxes should not be viewed in isolation but as a critical factor influencing a wide array of business decisions. They argue that effective tax planning involves understanding and managing the tax implications of various business strategies, rather than merely minimizing tax liabilities. Effective tax planning aims to maximize firm value by integrating tax considerations into financial and operational strategies. This requires a multilateral approach, assessing tax impacts on all parties involved in a transaction. Managers must evaluate how tax rule changes influence customers, employees, suppliers, and competitors. Additionally,

designing an efficient capital structure—whether financed through debt, preferred stock, or common stock—demands consideration of how returns are taxed for lenders and shareholders. Ignoring these factors can lead to competitive disadvantages and suboptimal financial decisions. Moreover, effective tax planning should consider all taxes, both explicit and implicit. For example, for the purpose of investment and financing decisions, not only explicit taxes (tax amounts paid directly to taxing authorities) are relevant but also implicit taxes (taxes that are paid indirectly in the form of lower before-tax rates of return on tax-favored investments).

1.3 Definitions and measures of tax avoidance

Over the past twenty years, there has been significant interest in corporate tax avoidance also from the academic perspective. Following the studies by Shackelford and Shevlin (2001) and Weisbach (2002), research on tax avoidance has expanded rapidly, focusing on identifying which companies engage in tax avoidance and the reasons behind it. Numerous studies have explored both internal and external factors influencing corporate tax avoidance. However, despite the extensive and growing body of literature on the subject, researchers have yet to agree on a universally accepted definition of corporate tax avoidance.

As Blouin (2014) highlights, a key empirical challenge in this research area is distinguishing between non-aggressive and aggressive tax avoidance activities. Hanlon and Heitzman (2010) were the first to attempt to define the phenomenon. Rather than differentiating between non-aggressive and aggressive tax strategies, they suggest viewing tax avoidance as a spectrum of strategies. This continuum, illustrated in Figure 1.1, encompasses a wide range of activities. At one end are legally permissible methods to reduce tax liability, such as investing in tax-advantaged municipal bonds. At the other extreme are high-risk, potentially abusive strategies involving tax havens.

Figure 1.1 The tax avoidance continuum

This figure describes the tax avoidance spectrum (Alexander & De Vito, 2021, p. 10)
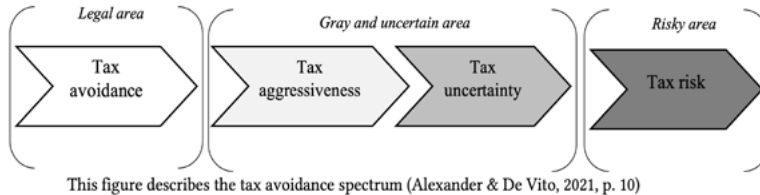
Within this framework, tax avoidance is not a binary concept but a gradient. It includes both clearly legal tax positions and more uncertain, riskier strategies that may occasionally cross into illegality (De Vito & Grossetti, 2024). These latter approaches are more likely to attract scrutiny and potential challenges from tax authorities. This perspective aligns with research by Desai et al. (2006) and Dyreng and Lindsey (2009), emphasizing that tax avoidance strategies can vary significantly in their level of risk and legal certainty. It acknowledges that while some tax reduction methods are universally accepted, others occupy a grey area that may invite regulatory examination. By presenting tax avoidance as a spectrum, this approach offers a more comprehensive and realistic view of the diverse strategies employed by organizations in their efforts to manage tax liabilities.

Similarly, Lisowsky et al. (2013) concentrate on a specific part of the tax avoidance spectrum, specifically tax aggressiveness and tax uncertainty. They suggest that these arise due to the challenges in interpreting ambiguous tax laws and predicting the outcomes of future tax audits (Mills et al., 2010). However, they concur with Hanlon and Heitzman (2010) that tax avoidance spans a continuum from highly certain (least aggressive) to highly uncertain (most aggressive and very risky). In summary, while tax avoidance includes all (certain) tax positions, tax aggressiveness refers to tax positions with relatively weaker supporting evidence, resulting in greater uncertainty.

Other research examines the opposite end of the spectrum, focusing on tax risk. This is because the tax authority might challenge the treatment of highly risky tax strategies (such as using subsidiaries in

tax havens), which could lead to future tax payments, sanctions, and penalties. The definition of tax avoidance as a spectrum of activities bears a non-trivial measurement issue. Can one proxy capture the full extent of tax planning activities along the tax avoidance continuum? Unfortunately, the answer is negative; therefore, the academic literature has developed several proxies to measure the firm-level tax avoidance outcomes that might be better suited to capture specific sets of activities but fail to take into account the whole spectrum.

1.3.1 The effective tax rate

Perhaps the most common measure used in academic research, the effective tax rates (ETRs) aim to measure the average tax rate per income unit or cash flow and is computed by dividing an estimated tax liability by a measure of pre-tax profits.

There are several types of ETR depending on what measure of estimated tax liability is used in the numerator. The GAAP ETR, for instance, is computed using the total income tax expense as numerator. The GAAP ETR ratio remains unaffected by tax strategies that defer taxes, such as accelerated depreciation for tax purposes. However, certain factors unrelated to tax planning, such as valuation allowance changes or tax contingency reserve adjustments, may still impact it. Moreover, the GAAP ETR directly affects accounting earnings.

On the other hand, the Cash ETR is calculated using cash taxes paid in the numerator. Cash ETR can be influenced by tax deferral strategies but not by changes in tax accounting accruals. The numerator focuses on actual income tax payments and excludes tax accruals, which can distort a firm's current tax expense.

Notably, there may be a discrepancy between the numerator and the denominator in the yearly Cash ETR if the cash taxes paid include taxes paid on earnings from a different period (e.g., as a result of a tax authority's audit completed in the current year), but the denominator only includes current period earnings.

Finally, Dyreng et al. (2008) have developed a long-term Cash ETR. This measure is computed by summing up the cash paid for income taxes over 10 years, scaled by the sum of pre-tax income (adjusted

for special items) during the same period. The main advantage of this measure is its focus on the long term, which reduces the year-to-year volatility usually observed in yearly ETRs. By using extended periods, the measure thus minimizes the mismatch between cash taxes paid and earnings. The use of cash taxes paid in the numerator is advantageous as it avoids the influence of tax accrual effects found in current tax expenses. Even seemingly similar measures such as the GAAP ETR and the Cash ETR capture distinct tax avoidance strategies, with the latter considering both temporary and permanent differences between the reported book income and the estimated taxable income.

1.3.2. Conforming vs. non-conforming tax strategies

Tax strategies that reduce income tax liabilities but not financial statement income, are called non-conforming tax avoidance. However, firms can also reduce their income tax liabilities by engaging in transactions that reduce both book and taxable incomes, which are referred to as conforming tax avoidance (Badertscher et al., 2019).

Incentives to minimize tax liability versus maximize profit play a different role depending on the level of capital market pressure the firm is facing, or in anticipation of large tax rate changes For instance, private firms for which capital market pressure is not relevant might adopt conforming tax strategies (Penno & Simon 1986; Maydew 1997). These studies examine specific transactions that reduce both book and taxable incomes, such as LIFO inventory decisions (Hunt et al., 1996) or gains and losses from sales and divestitures (Klassen 1997).

Most ETRs usually employ pre-tax GAAP earnings as the denominator, thus only capturing non-conforming tax avoidance (*i.e.*, transactions treated differently for book and tax purposes). Consequently, if a firm not constrained by financial accounting regulations (e.g., a private firm) manages to avoid a significant portion of taxes by reporting lower accounting earnings and taxable income (*i.e.,* conforming tax avoidance), effective tax rate measures would not capture such tax avoidance.

Among the non-conforming tax avoidance measures developed in the literature, the book-tax differences (or BTDs) is obtained by cal-

culating the difference between pre-tax book income and an estimate of taxable income; the latter is measured as the ratio between current tax expenses and the statutory corporate tax. A positive book-tax differences would indicate that the firm has engaged in tax avoidance strategies (Desai & Dharmapala, 2006; Wilson, 2009).

It is important to understand the extent to which firms employ conforming tax strategies, as some may show high effective tax rates (or small book-tax differences), leading outside viewers to mistakenly believe they are not avoiding income taxes, while in reality, they may be utilizing previously unnoticed book-tax conforming strategies. To fill this gap, Badertscher et al. (2019) develop a new measure of conforming tax avoidance based on the residuals from regressing the ratio of cash taxes paid to lagged total assets on positive and negative book-tax differences, by industry and fiscal year combinations.

1.3.3 ETR volatility

Guenther et al. (2016) adapt the concept of risk from corporate finance literature—defined as the range of possible outcomes or payoffs that reflect the degree of future uncertainty (Brealey et al., 2018)—and apply it to tax risk. They define tax risk as the level of uncertainty regarding future tax payments, sanctions, and penalties resulting from risky tax avoidance activities. Importantly, the authors argue that standard measures of reduced corporate tax burden do not adequately capture tax risk. They propose differentiating between the level of tax avoidance, indicated by prevailing effective tax rate measures, and the volatility of the effective tax rate, which more accurately reflects riskier tax positions.

1.3.4 Tax shelters and tax havens

Recent studies indicate that corporate tax shelters have become significant tools for reducing tax burdens. However, engaging in tax shelter activities entails positioning at the risky end of the tax avoidance continuum. Wilson (2009) examines the financial reporting effect of tax shelter participation on a sample of firms accused by the govern-

ment of engaging in tax shelter activity. His study develops a model to identify firm-specific characteristics that result from tax shelter participation (e.g., large differences between financial reporting income and taxable income) and firm characteristics associated with the type of firm likely engaged in tax-sheltering activity (e.g., firm size and a tendency toward aggressive financial reporting. Building on Wilson's (2009) model, Lisowsky (2010) shows that the likelihood of corporate tax shelter utilization is positively related to the presence of corporate subsidiaries located in tax havens, foreign-source income, inconsistent book-tax treatment, litigation losses, use of promoters, profitability, and size. His findings also suggest that tax shelter utilization is also negatively related to leverage. His model increases the explanatory power of the Wilson (2009) model and corroborates the result in Graham and Tucker (2006) of the negative relation between debt and tax shelters. Moreover, his findings reveal that active tax sheltering firms with robust corporate governance achieve positive abnormal returns, supporting the notion of shareholder wealth creation.

Richardson et al. (2020) develop a measure of tax haven intensity as the total number of subsidiaries incorporated in jurisdictions the OECD (2006) has identified as tax havens, scaled by the total number of subsidiaries in the previous year. This measure of tax haven intensity directly captures the intensity of firms' use of tax haven subsidiaries and the level of complexity and opacity of their tax haven-related foreign business operations (Desai et al., 2006; Akamah et al., 2018).

1.3.5 Unrecognized tax benefits

The tax risk portion of the tax avoidance continuum is hardly captured by the level of tax avoidance measured by ETRs. If a firm's tax planning strategies result in a low ETR that is sustainable in the long run, ETR-based measures would capture the level of the tax avoidance pursued by the corporation but not its tax uncertainty (Guenther et al., 2017). Unrecognized tax benefits (UTBs), mandated by FIN 48 (now ASC 740-10-25), represent a measure of managers' assessment of firm tax risk. UTBs are contingent liabilities that represent the dollar amount of estimated tax benefits that the firm expects will not be

recognized by tax authorities in the future (Armstrong et al., 2015). Lisowky et al. (2013), for instance, find that UTB disclosures reflect corporate tax shelter activities and the reserve is a suitable summary measure for predicting tax shelters. More recently, Ciconte et al. (2024) demonstrate that unrecognized tax benefits (UTBs) resolve in cash tax payments within five years, indicating that managers generally incorporate their expectations of future tax liabilities accurately. This finding holds true for firms that (1) are significantly impacted by FIN 48 implementation, (2) cannot factor detection risk into their reserves, (3) engage in higher levels of ex ante tax avoidance, (4) are suspected of using tax accounts for earnings management, and (5) experience plausibly exogenous shocks to tax reporting. Overall, the study suggests that FIN 48 accounting guidance enables managers to report contingent tax liabilities accurately and allows financial statement users to reliably forecast future cash obligations.

1.4 Regulation and International profit shifting

International differences in tax laws create tax loopholes that multinational firms can easily exploit to pursue international tax planning. Multinational firms have dramatically increased the scale of their operations over the last three decades (Desai 2009). In addition to reallocating real economic activities in response to value creation opportunities, these firms also exploit international differences in corporate income tax rates by engaging in profit shifting (e.g., for reviews, see Dharmapala, 2014; Heckemeyer & Overesch, 2017). Several empirical studies have documented multinationals' income shifting. For example, prior work has exploited cross-sectional variation in corporate tax rates on multinational subsidiaries' profitability (Gruber & Mutti 1991; Hines & Rice 1994; Huizinga & Laeven 2008). Other studies focus on specific profit-shifting channels, particularly in intra-firm trade activity (Bartelsman & Beetsma 2003; Clausing 2003) and debt shifting (Desai et al. 2004; Buettner & Wamser 2013; Dharmapala & Riedel 2013).

Another stream of literature examines profit-shifting incentives stemming from the tax rate differential between the country of the

parent company and that of the subsidiary. In particular, Dischinger et al. (2014) use this approach to investigate the peculiar role of the parent company in setting up a profit-shifting strategy within a multinational group. Their findings suggest that income shifting between a parent company and its subsidiaries is biased toward the parent company (the so-called headquarters bias). In line with this result, Weichenrieder (2009) finds a negative correlation between the tax rate of the host country and the reported profits at the multinational affiliate level. However, results are only weakly significant, leading the author to speculate—without testing this conjecture empirically—whether tax base– broadening reforms have compensated for the tax rate effect over the author's sample period.

The studies above all share the same empirical approach and measure the extent of profit shifting by exploiting variations in tax rates across countries. Starting with Bartelsman and Beetsma (2003), the literature on profit shifting has also investigated whether other tax regulations beyond the corporate tax rate play any role in facilitating or discouraging profit shifting. For example, Lohse et al. (2012) and Lohse and Riedel (2013) have developed an index to capture the stringency of transfer pricing regulations across European countries. In a similar vein, Beer and Loeprick (2015) assess the effect of transfer pricing rules and find that imposing documentation requirements on multinational companies mitigates income-shifting behavior. Furthermore, Buettner et al. (2012) and Blouin et al. (2014) analyze several thin capitalization regimes and conclude that these rules deter debt shifting.

Notably, though, these studies focus on only one anti-avoidance regulation at a time, either transfer pricing or thin capitalization rules. Alexander et al. (2020) identify profit shifting not only through variation in the tax rate but also through variation in the tax base. In their study, they consider multiple tax base items (*i.e.*, transfer pricing documentation requirements, thin capitalization rules, tax consolidation rules, loss carryback and carryforward, accelerated tax depreciation allowances, and group tax relief) that jointly target profit shifting, in-

stead of examining selected tax base items in isolation (*i.e.*, transfer pricing and/or thin capitalization rules).

They estimate the tax rate sensitivity of profit shifting conditional on several changes in the tax base elements that occurred in Europe during 2003–2013. Consistent with prior literature (Dischinger et al., 2014), they find that multinational companies shift profits into (or out of) their affiliates following a decrease (increase) in the tax rate of the host country (country where the subsidiary is located) or an increase (decrease) in the tax rate of the parent country (country where the headquarters are located). They also show that the income flowing between the host and parent countries is significantly lower when they account for policy changes aimed at broadening the tax base (e.g., the introduction of transfer pricing documentation requirements and/or thin capitalization rules, restrictions on the usage of tax losses).

Moreover, they analyze the direction of profiting shifting and provide evidence that tax base–broadening reforms matter for both inward profit shifting (*i.e.*, shifting income into a foreign affiliate) and outward profit shifting (*i.e.*, shifting income out of a foreign affiliate). Interestingly, though, they find that tax base items have a differential effect on multinationals' income shifting. Consistent with prior literature (e.g., Bartelsman and Beetsma 2003; Buettner et al. 2012; Beer and Loeprick 2015), anti-avoidance rules (*i.e.*, transfer pricing and thin capitalization rules) prevent multinational companies from shifting profits out of their foreign affiliates. However, they also find that other tax base–broadening rules, such as restrictions on the deductibility of tax losses or on group tax relief, are equally relevant to profit shifting. In particular, these rules reduce the incentives for multinational companies to shift profits into a foreign affiliate. In particular, they find a downward trend in profit shifting across European countries, as in the second half of their sample period (2007–2013) profit shifting decreased significantly, by more than 40%. Consistent with prior literature), their evidence suggests that broader tax bases have successfully constrained profit shifting over the years.

1.5 The undersheltering puzzle

Tax undersheltering describes a scenario in which firms, despite having both the means and opportunities to reduce their tax burdens, opt not to engage in aggressive tax avoidance strategies (*i.e.*, the so-called ''under-sheltering puzzle'' in Weisbach, 2002). This behavior challenges the traditional economic assumption that firms prioritize shareholder value maximization by minimizing all costs, including taxes. The central puzzle lies in understanding why some firms voluntarily incur higher tax expenses when they could legally and strategically reduce them.

The decision to refrain from aggressive tax avoidance can be attributed to several factors. First, firms may prioritize long-term reputational considerations over short-term financial gains. Aggressive tax strategies, while reducing immediate costs, can attract scrutiny from tax authorities, regulators, and the public. Such scrutiny may result in reputational damage, legal disputes, and financial penalties, all of which could outweigh the benefits of tax minimization. For instance, Lanis and Richardson (2015) argue that firms engaging in aggressive tax practices often face negative perceptions from stakeholders, including customers, investors, and employees, which can erode trust and harm their market position.

Second, firms may view tax compliance as part of their broader corporate social responsibility (CSR) strategy (for a review see Kovermann & Velte, 2021). Bird and Davis-Nozemack (2018) highlight that tax avoidance is increasingly seen as socially irresponsible behavior, conflicting with a firm's ethical obligations to contribute to society. Taxes play a vital role in funding public goods, reducing inequality, and fostering economic stability (GRI, 2022). Firms that align their tax practices with societal expectations may benefit from enhanced goodwill and stronger relationships with stakeholders, which can translate into long-term value creation.

Third, the internal governance structure of a firm can influence its approach to tax strategies. Firms with strong corporate governance mechanisms may avoid aggressive tax practices to mitigate risks associated with managerial opportunism. Desai and Dharmapala (2006)

suggest that aggressive tax avoidance can serve as a tool for managers to obscure financial performance, potentially leading to agency problems. By adopting conservative tax strategies, firms can signal transparency and accountability to shareholders, thereby fostering trust and reducing agency costs.

In addition, regulatory uncertainty and the risk of future policy changes may deter firms from engaging in tax avoidance. Aggressive tax strategies often rely on exploiting loopholes or ambiguities in tax laws, which may be closed through legislative reforms. Firms may perceive the potential costs of adapting to such changes or facing retroactive penalties as outweighing the benefits of aggressive tax planning.

Lastly, firms may also consider the alignment of their tax strategies with their overall business models and industry standards. For example, firms operating in highly regulated industries or those with significant government contracts may adopt conservative tax practices to maintain favorable relationships with regulators and policymakers. Similarly, multinational corporations may avoid aggressive tax strategies to reduce the risk of double taxation, trade restrictions, or other cross-border complications.

In conclusion, tax undersheltering reflects a strategic choice influenced by reputational concerns, CSR commitments, governance structures, regulatory risks, and industry-specific factors. While it may seem counterintuitive from a cost-minimization perspective, this behavior underscores the complex trade-offs firms face in balancing financial, ethical, and strategic considerations. Understanding these dynamics is crucial for policymakers and researchers seeking to analyze corporate tax behavior.

1.5.1 Factors contributing to tax undersheltering

To understand why some firms forgo tax avoidance opportunities, it is essential to examine the factors that drive tax undersheltering. These include the non-tax costs associated with tax planning activities and the risks involved. By delving into agency costs, corporate governance, ownership structures, capital market pressures, and managerial incentives, we can uncover the underlying reasons for this behavior.

One of the primary explanations for tax undersheltering lies in the non-tax costs associated with tax avoidance. These costs include reputational damage, regulatory scrutiny, and potential legal penalties. Aggressive tax strategies often attract attention from tax authorities, leading to audits, fines, and even prolonged legal battles. Firms may perceive these risks as outweighing the immediate financial benefits of tax savings. For instance, reputational damage can erode trust among stakeholders, including customers, investors, and employees, ultimately impacting a firm's long-term value. Lanis and Richardson (2015) emphasize that aggressive tax avoidance can harm a firm's reputation, making it less appealing to stakeholders who value ethical corporate behavior.

Additionally, the risk of regulatory scrutiny is a significant deterrent. Tax authorities worldwide are increasingly adopting sophisticated tools to detect tax avoidance practices. Firms that engage in aggressive tax strategies may face heightened scrutiny, which can lead to costly disputes and penalties. The long-term implications of such scrutiny, including the potential for policy changes or retroactive penalties, further discourage firms from pursuing aggressive tax avoidance.

The governance and ownership structure of a firm significantly influence its tax strategies. Family-owned firms or those with concentrated ownership often prioritize long-term stability and reputation over short-term gains. These firms are less likely to engage in aggressive tax planning, as they aim to maintain transparency and trust with minority shareholders and other stakeholders. Chen et al. (2010) found that family-owned firms engage in less non-conforming tax avoidance compared to non-family firms, highlighting the role of ownership structure in shaping tax behavior.

Strong corporate governance mechanisms also play a crucial role. Firms with robust governance structures are less likely to adopt risky tax strategies, as these mechanisms promote accountability and transparency. By avoiding aggressive tax planning, such firms signal their commitment to ethical practices, enhancing their credibility with investors and regulators.

The degree of pressure exerted by capital markets also affects a

firm's approach to tax planning. Publicly traded companies often face intense pressure to deliver consistent financial performance, driving them to minimize tax expenses aggressively. However, privately held firms or those with less market scrutiny may prioritize other strategic goals, such as sustainability or long-term value creation, over immediate tax savings. This distinction underscores the varying motivations behind tax strategies, depending on a firm's market environment.

Managerial incentives are another critical factor influencing tax behavior. When managers are compensated based on after-tax performance, they may be more inclined to engage in tax avoidance to boost short-term results. However, aligning managerial incentives with long-term firm value can discourage risky tax strategies. Desai and Dharmapala (2006) demonstrate that firms with weaker shareholder rights and lower institutional ownership exhibit a negative association between equity-based compensation and tax avoidance. This finding suggests that aligning managerial incentives with long-term goals can mitigate the risks associated with aggressive tax planning.

Firms must weigh the risks and benefits of tax avoidance strategies within their unique contexts. For some, the potential reputational and regulatory costs outweigh the financial gains, leading them to adopt conservative tax positions. For others, the pressures of capital markets or short-term managerial incentives may drive more aggressive approaches. Ultimately, the decision to engage in tax avoidance or undersheltering reflects a complex interplay of financial, ethical, and strategic considerations.

In conclusion, tax undersheltering is not merely a failure to exploit tax-saving opportunities but a deliberate strategy shaped by non-tax costs, governance structures, market pressures, and managerial incentives. Understanding these dynamics is crucial for policymakers, researchers, and practitioners seeking to analyze and influence corporate tax behavior. By addressing the underlying factors, firms can better balance their financial objectives with ethical and strategic imperatives.

1.6 Determinants and consequences of tax avoidance: A roadmap

Empirical evidence, such as the cross-sectional and within-industry variation in firms' effective tax rates, highlights that firms differ significantly in the taxes they pay relative to their pretax income (Dyreng et al., 2008). This suggests that some firms are more effective at reducing their tax liabilities compared to others within the same economy or industry. Additionally, certain firms pay fewer taxes than expected when their estimated taxable income is multiplied by the applicable statutory tax rate.

Such findings have motivated a growing body of empirical tax accounting research to explore the factors driving these variations in tax avoidance and the differing preferences firms exhibit in their tax planning strategies. Furthermore, considerable attention has been devoted to examining the consequences of tax avoidance, such as reputational damage or the extent to which markets recognize and value a firm's tax-saving efforts.

Several studies have investigated the relationship between firm characteristics such as size, profitability, capital intensity, capital structure (see Lietz, 2013 for a review) and tax avoidance using various proxies (e.g., GAAP ETR, tax shelter usage). For instance, Gupta and Newberry (1997) explored numerous determinants of GAAP ETRs, while Rego (2003) provided evidence suggesting that a larger scale of international operations leads to greater tax avoidance opportunities and lower GAAP ETRs. Both studies focused solely on non-conforming tax avoidance. Additionally, firms accused of using tax shelters tend to have larger book-tax differences, more foreign operations, subsidiaries in tax havens, higher previous year effective tax rates, greater litigation losses, and less leverage (Wilson, 2009; Lisowsky, 2010).

A young but growing body of empirical literature incorporates agency theory predictions into the analysis of corporate tax avoidance. One aspect of this research posits that if avoidance activities create value and managerial compensation aligns with shareholders' interests, then firms using more after-tax performance-based incentives should engage in more tax avoidance. Supporting this idea, Phil-

lips (2003) found that compensating business unit managers based on after-tax income results in lower GAAP ETRs. However, Desai and Dharmapala (2006) extended the theories in Slemrod (2004) and Desai et al. (2007) by modeling the effects of incentive compensation and governance structures on tax avoidance at the firm level, discovering a negative relationship between equity-based compensation and tax avoidance (measured by abnormal book-tax differences). Using cross-sectional variation, they found this negative association only among firms with weaker shareholder rights and lower institutional ownership. Desai and Dharmapala suggest that if managers engage in tax avoidance to increase managerial diversion, then increasing equity incentives to align managers and shareholders will decrease diversion, thereby reducing tax avoidance.

Ownership structure may also play a significant role. Tax policy can influence corporate ownership patterns and these patterns can, in turn, affect tax avoidance (Desai and Dharmapala, 2008). Firms with concentrated ownership, such as family firms studied by Chen et al. (2010), might avoid more taxes because controlling owners benefit more from the savings. Conversely, these firms might avoid fewer taxes because long-term concentrated holders may prioritize the total costs of avoidance, including reputational risks and minority shareholders' suspicions of diversion. Chen et al. (2010) found that family firms avoid fewer taxes than non-family firms, which aligns with Desai and Dharmapala (2006). This indicates that family-owned firms may sacrifice tax benefits to alleviate minority shareholders' concerns about family rent-seeking masked by tax avoidance activities. This finding also aligns with the evasion literature, suggesting that aggressive tax reporting is linked to an individual's risk aversion and intrinsic motivation. Relatively speaking, high-ownership family firms may behave more like individuals.

Recent studies go beyond firm-level characteristics and ownership. For instance, when the tax department is seen as a profit center, GAAP ETRs are lower, but Cash ETRs are not (Robinson et al., 2010). Armstrong et al. (2010) report similar findings regarding GAAP ETR and Cash ETR when testing tax director compensation contracts. More-

over, top executives significantly impact tax avoidance using both GAAP and Cash ETRs (Dyreng et al., 2010).

Overall, the field struggles to fully explain the variation in tax avoidance, despite progress in linking it to firm characteristics, manager effects, ownership, governance, and incentive structures. Some possible reasons are that the theory on corporate tax avoidance within an agency framework is relatively new and not well developed or sufficiently integrated into empirical research. Additionally, empirical measures of tax avoidance based on financial statements have known limitations, partly because they capture variation in tax avoidance as well as the choice between conforming and non-conforming tax avoidance. Reliable empirical measures of some interesting cross-sectional determinants, such as governance, are difficult to obtain because corporate governance is endogenous. Finally, tax avoidance may be highly idiosyncratic, influenced by numerous factors and interactions, not all of which can be measured.

While firms generally engage in corporate tax avoidance, the assumption that it always benefits them is overly simplistic. In line with the tax undersheltering puzzle, empirical evidence reveals a more complex reality, indicating that tax avoidance can also impose significant negative impacts on firm decisions.

More specifically, tax avoidance strategies impact financial reporting transparency as tax avoidance often involves complexity and information obfuscation to evade detection by tax authorities. Research indicates that tax avoidance reduces financial reporting transparency, negatively impacting firms and investors for two main reasons (Alexander & De Vito, 2021).

First, managers may use intra-company transactions through tax haven subsidiaries to lower tax burdens. To avoid detection and the loss of tax benefits, these transactions and subsidiary details are often not disclosed, reducing transparency and enabling potentially harmful managerial actions. Second, by obscuring financial information from tax authorities, managers may also make financial statements less clear, masking actual performance and distorting investors' perception of the firm's value.

In summary, these factors indicate that tax avoidance undermines financial reporting transparency. The associated costs of reduced transparency often surpass the benefits derived from tax savings, resulting in a negative relationship between tax avoidance and transparency, as highlighted by Chung et al. (2019), Balakrishnan et al. (2019), and Kerr (2019).

Tax avoidance impacts the cost of capital, but the relationship varies depending on the financing source—equity or debt. According to Lambert et al. (2007), tax avoidance can lower the cost of equity by increasing after-tax cash flows without altering their covariance with market cash flows (the "cash flow channel"). In this case, higher expected cash flows reduce equity costs. However, tax avoidance often influences a firm's operations and fundamentals, potentially altering the covariance of its cash flows with the market (the "covariance channel"). This change in covariance can be either positive or negative, depending on whether similar tax strategies are adopted by other firms in the industry. Consequently, the combined effects of these channels make it difficult to determine whether tax avoidance has a net positive or negative impact on the cost of equity capital, highlighting the complexity of this relationship.

While Goh et al. (2016), for instance, find that the cost of equity is lower for U.S. firms, which is consistent with investors rewarding tax-avoiding firms that maximize after-tax cash flows, Brooks et al. (2016) find evidence of share price drops and increase in cost of equity capital around news announcements of the potential involvement tax schemes in a sample of U.K. firms. The findings point to investors' awareness of the cash flow implications of sheltering taxes (e.g., future payments of taxes and penalties) and consequent demand for higher returns to balance the risk embedded in such activities.

Another dimension strictly connected to tax avoidance is firm value, given its effect on the cost of capital. On the one hand, tax avoidance affects firm value via higher future after-tax cash flow (*i.e., the cash flow channel*). On the other hand, tax avoidance negatively affects firm value due to the agency conflicts arising from the reduced corporate transparency (Desai and Dharmapala, 2009) and the volatility of the

tax payments stemming from the potential risk that the economic benefits of reduced tax burden might be overturned Jacob and and Schütt (2020).

Tax avoidance impacts also the cost of debt, suggesting that lenders disapprove of tax avoidance. Unlike shareholders, debt holders face asymmetric payoffs and significant downside risk. Even when tax avoidance generates savings, these benefits typically accrue to shareholders (e.g., through higher dividends), while the associated risks often fall on lenders, who are fixed claimants and do not share in the rewards. Consequently, lenders generally oppose tax avoidance activities. Previous studies support this view, finding evidence of higher loan spreads (Hasan et al., 2014; Isin, 2018; Shevlin et al., 2020) and shorter debt maturities (Platikanova, 2017) charged to tax avoiders, leading firms to reduce their tax planning outcomes when renegotiating large portions of debt maturing during industry downturns (Alexander & Pisa, 2023).

Moreover, tax avoidance and capital structure are deeply connected, given the existence of the tax debt shield, which posits that interest payments on debt are tax-deductible, reducing a firm's taxable income and overall tax liability. Therefore, firms have clear incentives to use debt financing to optimize their capital structure. Moreover, internal debt shifting within multinationals is used to shift profits to low-tax countries (Desai et al., 2004; Huizinga & Laeven, 2008). However, tax avoidance strategies, such as income shifting or tax shelters, can serve as non-debt tax shields, substituting the need for debt-related tax benefits. Consequently, firms engaging in high levels of tax avoidance may rely less on debt, altering their capital structure. Graham and Tucker (2006) focus on a sample of firms participating in tax shelters and find that sheltering firms use less leverage than firms that did not engage in tax shelters.

Tax avoidance activities can have real consequences for corporate investment decisions because tax avoidance affects the firm-specific effective corporate tax rate (Jacob, 2022). Most corporate tax systems do not allow investment costs to be fully tax-deductible; as a consequence, capital represents a less attractive input factor. Even when

investments are fully debt-financed and when financing costs are fully deductible, firms might choose a similar input mix, as tax depreciation allowances are generally based on historical rather than replacement costs, thereby falling below the real economic depreciation (Desai, 2003).

As a result, firms will resort to less capital input. Tax avoidance is crucial in reducing this tax impact, as it can decrease the tax base and reduce the tax burden (Dyreng et al., 2022). Tax optimization strategies can influence investment choices for firms under financial constraints by altering the effective tax rate on potential investments while simultaneously impacting the volume of internally generated capital available to finance such projects (e.g., Edwards et al., 2016; Law and Mills, 2015). Consequently, financially constrained firms experience the effect of limited tax avoidance opportunities on the tax sensitivity of investment even stronger (Jacob, 2022).

Intangible assets are can be used to shift taxable income from high-tax areas to low-tax areas to reduce income taxes (Bartelsman and Beetsma, 2003; Grubert and Slemrod, 1998). Tax avoidance through tax-motivated income-shifting transactions using intangibles reduces the projected after-tax net present value (NPV) of innovation projects. Thus, tax avoidance could be positively related to innovation activities (Li et al. 2021).

Tax avoidance has also implications for mergers and acquisitions (M&A) strategies, as tax management can be viewed as a potential driver of ownership advantage. For instance, Hu et al. (2021) examine the impact of corporate control on tax planning by leveraging the staggered enactment of M&A laws across countries as an exogenous shock. Using a difference-in-differences approach, they find that tax avoidance significantly decreases following the passage of takeover laws. The findings suggest that this reduction is driven by decreased rent extraction by management, rather than managerial effort aversion or increased risk concerns related to aggressive tax strategies.

1.7 Conclusion

This chapter has provided a comprehensive overview of corporate tax avoidance, presenting it as a multifaceted phenomenon with significant implications for firms, stakeholders, and policymakers. Tax avoidance exists along a continuum, encompassing both legal strategies aimed at minimizing tax liabilities and more aggressive practices that may border on illegality. This spectrum highlights the complexity of tax planning, where firms must balance financial benefits against reputational, regulatory, and governance-related risks.

The discussion has emphasized the dual perspectives on tax avoidance. On one hand, it is seen as a rational financial strategy aligned with shareholder value maximization, where firms leverage tax planning to allocate resources more efficiently. On the other hand, tax avoidance raises ethical and social concerns, as it may undermine public trust, exacerbate inequality, and conflict with corporate social responsibility (CSR) principles. These opposing viewpoints underscore the need for nuanced approaches to understanding and managing tax behavior.

The chapter also explored the determinants of tax avoidance, including firm characteristics, governance structures, managerial incentives, and ownership patterns. It was noted that firms' tax strategies are influenced by a variety of factors, such as reputational concerns, regulatory scrutiny, and the pressures of capital markets. For instance, family-owned firms or those with strong governance mechanisms may adopt more conservative tax positions to maintain transparency and stakeholder trust. Conversely, publicly traded companies under intense market pressure may engage in more aggressive tax planning to meet short-term performance goals.

A key insight discussed is the "under-sheltering puzzle," which challenges the assumption that firms always seek to minimize their tax burden. This phenomenon highlights the trade-offs firms face between the benefits of tax savings and the potential costs, such as reputational damage or regulatory penalties. By refraining from aggressive tax avoidance, some firms prioritize long-term value creation and societal expectations over immediate financial gains.

The chapter further examined the consequences of tax avoidance,

particularly its impact on financial reporting transparency, cost of capital, and firm value. Tax avoidance often involves complex and opaque practices that reduce transparency, potentially distorting investors' perceptions and increasing agency conflicts. Additionally, while tax avoidance can lower the cost of equity through higher after-tax cash flows, it may also increase the cost of debt due to lenders' aversion to the associated risks. These dynamics illustrate the intricate relationship between tax strategies and a firm's financial and operational outcomes.

Finally, the chapter highlighted the role of regulatory frameworks and international profit-shifting practices in shaping tax avoidance behaviors. Multinational firms exploit differences in tax laws across jurisdictions, but anti-avoidance regulations, such as transfer pricing and thin capitalization rules, have been effective in curbing these practices. The discussion of tax base–broadening reforms and their impact on profit shifting underscores the importance of coordinated policy efforts in addressing tax avoidance on a global scale.

In conclusion, corporate tax avoidance is a complex and evolving issue that requires a balanced approach, integrating financial, ethical, and regulatory considerations. By understanding the determinants, consequences, and broader societal implications of tax strategies, firms and policymakers can better navigate the challenges and opportunities associated with corporate tax planning. This framework sets the stage for further research and policy development aimed at fostering transparency, equity, and accountability in corporate taxation.

Chapter 2 Tax avoidance and tax risk

2.1 Overview

The chapter provides an in-depth analysis of the determinants and implications of corporate tax avoidance strategies, focusing on the ability of firms to sustain long-term tax planning while minimizing associated risks. Tax avoidance is a critical aspect of corporate financial strategy, enabling firms to reduce their tax burdens and enhance after-tax cash flows. However, such strategies are often accompanied by significant risks, including regulatory scrutiny, reputational damage, and financial instability. This chapter emphasizes the importance of understanding the factors that differentiate successful tax avoiders—firms that achieve low tax burdens without incurring excessive tax risk—from those that fail to strike this balance.

The study identifies successful tax avoiders as larger firms with fewer sales, extensive foreign operations, stable earnings, and strong growth potential. These firms manage to maintain low effective tax rates (ETRs) while minimizing tax risk, which is measured through ETR volatility and unrecognized tax benefits (UTBs). By employing a multinomial logit model, the research categorizes firms into four groups based on their tax outcomes: low tax avoidance and low risk, low tax avoidance and high risk, high tax avoidance and low risk, and high tax avoidance and high risk. The findings reveal that some firms can simultaneously achieve low ETRs and low tax risk, challenging the conventional notion of a trade-off between tax avoidance and tax risk.

The chapter also explores firms' dynamics of entering and exiting the tax avoidance-tax risk categories, highlighting the characteristics that enable firms to sustain favorable tax outcomes over time. Factors such as profitability, cash flow, leverage, and earnings volatility play crucial roles in determining a firm's ability to maintain low tax rates and low tax risk. Additionally, the study examines the broader economic implications of tax avoidance and risk, including their impact on firm valuation, investment decisions, and government tax revenues.

Overall, this chapter contributes to the literature by treating tax avoidance and tax risk as distinct yet interconnected dimensions, offering a nuanced understanding of the determinants of sustainable tax strategies. It underscores the importance of balancing tax planning with risk management, providing valuable insights for policymakers, regulators, and corporate decision-makers.

2.2 Introduction

Firms engage in tax planning to minimize income tax payments as part of their optimization strategies. Some firms are even able to pay zero income taxes on their reported income, raising a lot of public attention and media concern (Dyreng et al., 2016). However, managing to pay very low-income taxes over a longer period involves the ability to pursue a sustainable tax planning strategy as aggressive tax avoidance also comes with several risks. Multinational firms are under the scrutiny of national and international tax authorities for exploiting tax loopholes that might result in unfavorable settlements. Dyreng et al. (2019) describe one of the drawbacks of tax avoidance in terms of tax *uncertainty*, defined as the likelihood of grey area tax avoidance being unsuccessful.

The potential costs of tax avoidance have been investigated by Hanlon and Slemrod (2009) that showed a negative stock market reaction to news concerning company involvement in tax shelters. Moreover, firms with greater tax avoidance incur higher spreads when obtaining bank loans (Hasan et al., 2014) and might prefer to limit their tax

avoiding strategies to regain access to credit markets when facing refinancing constraints (Alexander and Pisa, 2023). Overall, one interpretation of these findings is that investors might perceive tax avoidance practices as potentially value-enhancing but risk-engendering corporate activities (Rego and Wilson, 2012).

To further investigate the implications of tax uncertainty, Dyreng et al. (2019) examine how tax avoidance is associated with uncertainty, when the latter is defined as the potential loss of tax savings when the tax positions are challenged by the tax authority. They find tax avoiding firms bear significantly more tax uncertainty (*i.e.*, higher unrecognized tax benefits, UTB) on average, than firms that avoid less taxes. In terms of economic magnitude, they find that the mean tax avoider paid about $650 million of cash taxes while the mean tax non-avoider paid $1,261million of cash taxes over a typical five-year period. At the same time, the mean tax avoider also faced more tax uncertainty, increasing its UTB account by $139 million, compared to an increase of only $68 million for the mean non-avoider over the five-year periods.

However, higher levels of tax avoidance might not automatically translate into riskier, more uncertain tax positions. Guenther et al., (2018) investigate whether higher levels of tax avoidance by U.S. corporations are, at the margin, more uncertain than lower levels of tax avoidance. Their findings show that the percentage of incremental tax avoidance reflecting additions to UTB reserve is not larger for groups engaging in higher rates of tax avoidance, suggesting that higher rates of tax avoidance might not translate into additional uncertainty.

This study explores firms' tax avoidance and tax uncertainty outcomes, focusing on why some firms consistently pay minimal taxes while others do not. It examines firm characteristics influencing tax strategies, considering both tax avoidance and tax risk. Prior research (Desai and Dharmapala, 2009; Drake et al., 2019; Hutchens and Rego, 2015) indicates that the value derived from tax avoidance may depend on the associated risk level. Aggressive tax strategies can reduce tax burdens and boost after-tax cash flows but may incur costs due to unsustainability and increased future tax uncertainty. This uncertainty

can affect future after-tax cash flows, even if pre-tax cash flow uncertainty remains unchanged.

While most studies focus on the existence of a trade-off between tax avoidance and tax risk, we follow Drake et al. (2019) whose results suggest that the tax strategy dimensions (*i.e.*, tax avoidance and tax risk) are distinct constructs that should be examined within a unified framework. Specifically, we aim to further understand the determinants of joint tax outcomes (*i.e.*, tax avoidance and tax risk) and investigate firm characteristics associated with the ability of sustaining tax avoidance in the long run. Measuring tax avoidance by effective tax rates and tax risk by volatility in effective rates and by unrecognized tax benefits, we focus on the characteristics that lead to any potential tax outcome (*i.e.*, the combination of the two tax strategy dimensions).

To begin our analysis, we identify firms that show high levels of tax avoidance across several proxies acknowledged in the literature into four different groups, according to their tax outcomes (high vs. low level of tax avoidance and high vs. low tax risk)1. We classify firms in the *Low-Low* quadrant if they experience low effective tax rates (*i.e.*, high tax avoidance) and low tax risk; *High-Low* is the group of firms with high effective tax rate but low tax risk; *Low-High* is the group of firms that show low ETRs but high tax risk; *High-High* defines firms with both high ETRs and tax risk. We aim to provide more inclusive evidence by focusing on determinants of the actual tax strategy outcomes rather than desired strategy outcomes. Surprisingly, preliminary analysis shows that some firms are in fact capable to implement tax planning strategies that minimize the tax burden through low effective tax rates and simultaneously minimize tax risk. This suggests that the trade-off between tax avoidance and tax risk may not hold for all firms, as some firms appear to be less burdened.

Our univariate results indicate significant differences in the determinants of the two tax strategy dimensions, tax risk and tax avoidance, when they are examined jointly. Specifically, our current main focus is on the difference in firms' characteristics that might explain

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[1] We define high versus low ETR or ETR volatility as above and below the sample median, respectively.

tax planning outcomes in terms of tax avoidance and how these determinants explain the riskiness of the tax strategy. While it is possible for both groups (Low-Low and Low-High) to have a low three year ETR (CASH or GAAP), it appears that firms that are experiencing less tax risk are: larger, have fewer sales, but more foreign operations, less volatile earnings and a higher growth potential. When we compare firms that are seemingly not engaging in tax avoidance (*i.e.*, firms with three-year effective tax rates above the distribution median), the determining factors to have predictable/persistent tax expense are: higher sales, less leverage, higher growth potential, lower R&D, more intangibles, fewer losses and specifically more cash flows, higher ROA and lower ROA volatility. It appears that the difference between these two groups is largely determined by tax risk inherent to the firms´ operations, rather than by the uncertainty surrounding the tax strategy.

Moreover, we examine firms´ characteristics that increase the likelihood of a firm not just to fall in the *Low-Low* category, but to successfully maintain low effective tax rates and low tax risk for at least three consecutive years. Considering the GAAP ETR, results show that the level of profitability, net operating losses, and discretionary accruals are negatively associated with the probability of enter, while there is a positive association with cash flow. On the other hand, leverage, ROA volatility, and deferred effective tax rates are negatively associated with the probability of exit, while R&D, intangibles, discretionary accruals, and unprofitable years are positively associated with the exit likelihood. Overall, we provide some preliminary insights into determinants of different tax strategy outcomes.

We follow Drake et al. (2019) and contribute to the literature by treating tax avoidance and tax risk as two separate dimensions. While some studies (Jacob & Schütt, 2020; Neuman et al., 2020) look at tax strategies that pursue minimization versus sustainability (proxied by a combination of the concepts of tax avoidance and tax risk), we provide early evidence regarding the cross-sectional variation in the tax avoidance – tax risk trade-off.

Understanding the determinants of firms' tax strategies has several implications as tax avoidance and uncertainty are associated with key

economic consequences such as the level and timing of investments (Jacob et al., 2022), the precautionary use of cash holdings (Hanlon et al., 2017), earnings persistence (Hanlon, 2005; Blaylock et al., 2012), firm valuation (Hutchens & Rego, 2015), and the cost of debt (Hasan et al., 2014; Shevlin et al., 2019). At the macroeconomic level, tax risk and the resulting variation of firms' tax payments could translate into more volatile and less predictable government tax revenues that lead several countries to reduce the volatility of tax revenues by setting specific tax accounting rules (Goncharov & Jacob, 2014).

2.3 Theoretical background and overview of the literature

2.3.1 Tax avoidance literature

Over the last two decades, there has been a call for more literature on the determining factors of tax avoidance (Shackelford and Shevlin, 2001; Maydew, 2001; Shevlin, 2007; Hanlon and Heitzman, 2010). Rational behavior would suggest that tax planning strategy is optimized at the firm level taking into account all costs and benefits. Dyreng et al. (2008) show that there is severe variation in the extent to which companies are able to sustain a low cash effective tax rate in the long run. Specifically, this observed heterogeneity in both long-term and short-term effective tax rates across firms has been puzzling researchers (e.g. Weisbach, 2002; Desai and Dharmapala, 2006; Dyreng et al., 2008; Hanlon and Heitzman, 2010; Graham et al., 2014). Hence, the unanswered question as to why many firms pay a substantial amount of taxes whereas other firms pay hardly any taxes at all has been designated the 'under-sheltering puzzle'.

A large stream of literature investigates determinants and consequences of firms' tax avoidance, which is often defined as in Dyreng et al. (2008), who use a very broad definition of tax avoidance that includes the reduction of corporate effective tax rate over a long time period or in Hanlon and Heitzman (2010), any reduction in explicit tax rates. An increasing number of firm and management characteristics have been associated with tax avoidance in recent years: po-

litical costs and political connections (Mills et al., 2012; Dyreng et al. 2016; Kim and Zhang, 2015), costs of debt and equity (Goh et al., 2016; Hasan, et al. 2014), financial transparency (Frank et al., 2009; Balakrishnan et al., 2019), management and their incentives (Phillips, 2002; Dyreng et al., 2010; Armstrong et al., 2012), internal information environment and tax department evaluation (Robinson et al., 2010; Gallemore and Labro, 2015), business strategy (Higgins et al., 2015; Kubick et al., 2015), enforcement (Hoopes et al., 2013; De Simone et al., 2016a), and stock price crash risk (Kim et al., 2011). In addition, more aggressive forms of tax avoidance may (or may not) bear reputational costs (Hanlon and Slemrod, 2009; Graham et al., (2014); Gallemore et al. (2014)) or lead to future cash outflows in the form of settlement of taxes, interest, and penalties (Bauer and Klassen, 2014).

More recently, there has been a shift of attention from the level of long-term effective tax rates to the volatility in annual effective tax rates as a low effective tax rate might not be sustainable and could revert to the mean or even lead to high effective tax rates in the future. In other words, today's aggressive tax planning could negatively affect future tax outcomes (e.g., Dyreng et al., 2008; Dyreng et al. 2016). Consequently, relying on finance theory, the volatility in annual effective tax rates is coined tax risk.

2.3.2 Tax risk literature

If tax avoidance only increased cash-flow benefits without costs, firms would engage more in tax planning. However, the costs of tax planning explain variations in tax avoidance across firms. Research highlights that tax avoidance increases uncertainty in future tax payments due to tax authority investigations, regulatory changes, and ambiguity in tax strategies. Additionally, low effective tax rates from aggressive tax avoidance may draw scrutiny from tax authorities or public attention, as noted by Bozanic et al. (2016) and Dyreng et al. (2016). These risks and uncertainties deter firms from fully exploiting tax planning opportunities, contributing to the under-sheltering puzzle.

To define tax risk, we follow prior research by Guenther et al. (2016)

and Drake et al. (2019) that rely on the classical view in finance, according to which risk is identified as the dispersion of potential outcomes from an investment. Consequently, we measure tax avoidance by effective rates and tax risk by volatility in effective rates. While prior research mainly focuses on the trade-off between return and risk in tax planning, we focus on the characteristics that lead to any potential tax outcome (*i.e.,* the combination of the two tax strategy dimensions). Allowing the two dimensions to vary independently, we focus on four different groups of firms, classified according to their tax outcomes[2].

The first group (*Low-Low*) exhibits a low (below median) long-term (3 year) effective tax rate (GAAP ETR or Cash ETR) and little volatility in annual effective tax rates. This group shows the ability to take advantage of benign tax-favored investments (Dyreng et al., 2016; Guenther et al., 2016) that are unlikely to be challenged by the tax revenue service, such as investments in municipal bonds. Another example of low risk tax planning strategies is given by Edwards et al. (2016) in the form of deferred tax strategies through Property, Plant, and Equipment reclassification. These tax avoidance activities that lower a firm's current tax payments would generally not lead to uncertainty in future tax expense or settlements. Hence, the absence of uncertainty regarding future tax payments is designated as low tax risk (measured by annual effective tax rate volatility).

The second group (Low-High) exhibits a low long-term (3 year) effective tax rate (GAAP or Cash), but high (above median) volatility in annual effective tax rates. This group is the one that is typically referred to in prior research that optimizes tax expense at the (potential) cost of experiencing higher tax expenses when tax positions are challenged and overturned. We also look into the determinants of being part of the alternative third group (*High-Low*) that appears to refrain from tax planning and therefore experiences a low tax risk, evidenced by a high long-term (3 year) effective tax rate (GAAP or Cash) and low (above median) volatility in annual effective tax rates.

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[2] Naturally, we are aware that measurement of tax outcomes does not necessarily reflect tax planning efforts or intentions. In addition, we acknowledge the limitations of the tax outcome measures we use (e.g. Manzon and Plesko, 2001: De Simone et al., 2016b).

These two groups usually reflect the basis for papers that examine the return versus risk trade-off in tax planning and tax strategies. Several studies provide evidence that either directly or indirectly supports this trade-off notion and have suggested that the link between tax avoidance and firm value could depend upon the degree of risk involved in the tax strategy implemented (Desai and Dharmapala 2009, Hutchens and Rego 2015, Drake et al. 2019; Jacob and Schütt 2020). In addition, Rego and Wilson (2012) find a negative relation between the CEO's risk-taking incentives and the level of the firm's Cash ETR. Hasan et al. (2014) and Shevlin et al. (2019) find a negative relation between tax rates and several types of debt costs. These studies provide evidence for the companies that experience outcomes as in our second group. On the other hand, Chi et al. (2017), Kubick et al. (2020), and Badertscher et al. (2013) find a positive association between firms' tax rates and management's inside debt or equity holdings, consistent with the idea that managers avoid risky tax reduction strategies to protect their own portfolio. These results are consistent with the idea that management prevents engaging in tax strategies that lower the firm's expected tax rate because they deem such strategies to be risky, which would be consistent with the tax dimensions of the firms that are classified in our third group.

The fourth and final group (High-High) in our sample includes firms that both have high long-term effective tax rates and high volatility in annual effective tax rates. These firms are of interest to our study because their tax outcomes suggest that while these firms experience a considerable amount of tax risk, they are unable to benefit from lower tax expenses, contributing to the under-sheltering puzzle. Neither do these firms fit in either strategy (avoidance vs. sustainability) that is put forward by Neuman et al. (2020) and McGuire et al. (2013).

2.4 Variable measurement

2.4.1 Tax avoidance measurement

We rely on two measures of tax avoidance to try to capture the con-

tinuum of tax planning strategies, namely GAAP and Cash effective tax rates (Dyreng et al., 2008). GAAP ETR is measured as income tax expense over pretax income less special items (TXT/(PI-SPI)). CASH ETR is measured as cash taxes paid over pretax income (TXPD/(PI-SPI)). We follow Dyreng et al. (2008) and to alleviate concerns over potential issues related to these measures, we compute ETRs over multiple years, namely as the three-year rate from year t to t+2.

2.4.2 Tax risk measurement

Previous studies (McGuire et al., 2013; Guenther et al., 2016; Jacob & Schütt, 2020; Drake et al., 2019) have argued that the level of tax avoidance alone does not capture the risk of the tax strategies implemented to decrease the tax burden. This suggests that proxies of tax avoidance commonly used in the literature such as effective tax rates might not effectively capture tax risk. We interpret tax risk as uncertainty about the magnitude and volatility of the firms' future profits and cash flows due to possible detection by the tax authority, which might lead to tax repayment or penalty. We therefore use the volatility of the effective tax rate to proxy for tax risk, where GAAP ETR 3 Vol and CASH ETR 3 Vol are the standard deviations of annual GAAP and cash effective tax rates from t to t+2[3]. As an alternative measure of tax risk, we use the unrecognized tax benefits (UTBs), defined in FIN 48, which capture executives' assessments of the riskiness of a firm's tax planning strategies[4]. UTBs are contingent liabilities that represent the dollar amount of estimated tax benefits that the firm expects will not be recognized by tax authorities in the future. This measure has been used by previous studies in relation to tax uncertainty (Lisowsky,

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[3] We use Cash ETR and GAAP ETR-based measures of tax avoidance and tax risk as alternatives. While recent literature focuses on variation in cash taxes paid (Guenther et al., 2016; McGuire et al., 2013), survey evidence provided by Graham et al. (2014) suggests that the focus of firms and managers is more on GAAP ETRs and low volatility of GAAP ETRs, than on Cash ETRs.

[4] Effective for fiscal years beginning after December 15, 2006, FIN 48 required firms to estimate, record, and disclose a contingent liability for uncertain tax benefits (UTBs) in their financial statements, providing investors information about a firm's tax positions that was not available before.

2010; Blouin et al., 2012; Rego & Wilson, 2012; Beck and Lisowsky, 2013; Lisowsky et al., 2013; Hanlon et al., 2017; Ciconte et al., 2024) to investigate the riskier end of tax avoidance continuum outcomes and tax sheltering. However, this measure presents some limitations, since UTBs are associated with a certain degree of discretion. FIN 48 requires a two-step procedure according to which tax positions undergo a "more likely than not" recognition test. Nevertheless, there is evidence (Ciconte et al., 2024) of UTBs being an unbiased measure of the potential for future tax cash outflows, since it appears that there is no systematic under- or overstatement of tax uncertainty.

2.5 Empirical research design

Previous studies on the determinants of tax avoidance (e.g. Badertscher et al., 2013; Chen et al., 2010; Hasan et al., 2014; Kubick et al., 2020; Rego and Wilson, 2012; Shevlin et al., 2019) have investigated the cross-sectional variation in tax planning outcomes, suggesting the existence of a trade-off between avoidance and tax risk. Nevertheless, to our knowledge no previous study has empirically investigated the distribution of tax avoidance and tax risk jointly, incorporating all possible outcomes with regard to these two dimensions. To do so, we classify firms into different groups along the two dimensions (*i.e.*, tax avoidance and tax risk). First, we split firms into low (high) tax avoidance if the ETR is below (above) the median of the distribution in a given industry (two-digits SIC code) and year[5]. Second, we divide firms in a similar way according to the distribution of tax risk. We split firms into low (high) tax risk if the ETR volatility is below (above) the median of the distribution in a given industry (two-digits SIC code) and year. Finally, we categorize firms into four groups along the two dimensions, as described in Figure 2.1 below:

Group 1: Low – Low is the group of firms that have both an ETR and ETR volatility below the industry – year median;

Group 2: Low – High gathers firms with ETR below the industry – year median but ETR volatility above the industry – year median;

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[5] We require at least 20 observations for each industry-year combination.

Group 3: High – Low shows firms with ETR above the industry – year median but ETR volatility below the industry – year median;

Group 4: High – High groups firms with both high ETR and high ETR volatility that are above the industry – year median.

Fig. 2.1 Tax avoidance and tax risk matrix.
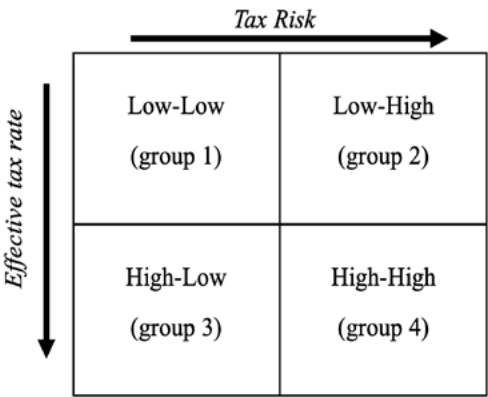
This figure describes the tax avoidance (measured by the effective tax rate) and tax risk matrix.

Our aim is to investigate whether different firm characteristics are associated with the likelihood of being in one group or another. In other words, we are interested in finding which firm characteristics play a role in determining the outcome of the firm´s tax planning strategy considering both tax avoidance and tax risk.

We are interested in analyzing firms´ characteristics associated with the likelihood of being successful in decreasing the tax burden together with the tax risk associated with the tax planning strategy. In addition, we aim at finding the determinants of being subject to both high effective tax rates and high tax risk. Providing evidence on the determinants of this distribution may contribute to our understanding of the under-sheltering puzzle. In order to analyze each combination of tax avoidance and tax risk, we estimate the following model using a multinomial logistic regression:

$$Tax\ Quadrant_{i,t} = \alpha + \beta_1\ Size_{i,t} + \beta_2\ Sales_{i,t} + \beta_3\ Leverage_{i,t} + \beta_4\ MtB_{i,t} + \beta_5\ R\&D_{i,t} + \beta_6\ Capx_{i,t} +$$
$$\beta_7\ Intangible_{i,t} + \beta_8\ Pre-Tax\ ROA_{i,t} + \beta_9\ ROA\ Vol_{i,t} + \beta_{10}\ NOL_{i,t} + \beta_{11}\ Foreign_{i,t} +$$
$$\beta_{12}\ Discr.Acc_{i,t.} + \beta_{13}\ Cash\ Flow_{i,t} + \beta_{14}\ Loss_{i,t} + Industry\ FE + Year\ FE + \varepsilon_{i,t} \qquad (Eq.1)$$

Tax Quadrant is a categorical variable that takes four different values:

Tax quadrant is equal to 1 if the firm is in the low ETR and low ETR volatility group;

Tax quadrant is equal to 2 if the firm is in the low ETR and high ETR volatility group;

Tax quadrant is equal to 3 if the firm is in the high ETR and low ETR volatility group;

Tax quadrant is equal to 4 if the firm is in the high ETR and high ETR volatility group.

We repeat the estimation of equation (1) with alternative measures of tax avoidance and tax risk. First, we use the three-year *GAAP ETR* and its volatility (*GAAP ETR 3 Vol*) to define *Tax Quadrant*, then we use the three-year *CASH ETR* and its volatility (*CASH ETR 3 Vol*). Finally, we use the three-year *CASH ETR* with an alternative measure of tax risk, namely the unrecognized tax benefits (*UTB*) to define *Tax Quadrant.*

According to previous studies discussing determinants of tax avoidance and tax risk (e.g. Dyreng et al. 2010; Frank et al. 2009; Rego et al. 2003), equation (1) examines the influences of the most likely determinants of tax strategy: the natural log of total assets (*Size*), the natural log of sales (*Sales*), capital structure (*Leverage*), growth opportunities (*MtB*), research & development expenses (*R&D),* capital expenditures (*CAPX*), intangibles (*Intangible*), pre-tax returns on assets (*ROA*), the standard deviation of pre-tax ROA (*ROA Vol),* an indicator variable for net operating loss carryforwards (*NOL*), foreign pre-tax income (*Foreign*), discretionary accruals (*Discr. Acc.*), and *Cash Flow.* With the exception of long-term effective tax rates, all variables are winsorized at 1-99%. All the variables are described in Appendix 2.A. We also include industry (two-digits SIC code) and year fixed effects and compute robust standard errors clustered at firm level. We regress equa-

tion (1) alternating the labelling of the reference group in order to compare firms´ characteristics across the four groups.

2.6 Data and summary statistics

We use Compustat data over the period 1988–2013[6]. The analysis with UTB uses a sample that starts in 2007, since FIN 48 became effective starting in 2007. Consistent with prior tax avoidance studies, we eliminate financial institutions (SIC from 6000–6999) and utility firms (SIC codes 4900–4999). We also drop all firm–year observations missing data required to compute the tax avoidance, the tax risk, and the control variables used in our analysis.

The sample using GAAP ETR and GAAP ETR Vol consists of 29,333 firm-year observations. The sample using CASH ETR and CASH ETR Vol consists of 26,901 observations and the sample using CASH ETR and UTB is relatively smaller due to data availability and consists of 6,399 observations (from 2007-2013).

Table 2.1, Panel A provides descriptive statistics for the tax measures based on GAAP ETR and firm characteristics for the full sample. Panel B presents similar descriptive statistics using tax measures based on CASH ETR, while Panel C uses UTB as alternative measure of tax risk combined with CASH ETR. The first thing that is noticeable is that there is a non-trivial amount of companies that falls in the groups where there is no evidence of a trade-off between tax rate and tax risk. The *Low-Low* group (*High-High*) holds firms with low (high) effective tax rates and low (high) effective tax rate volatility or UTB's. These groups together represent 35.70% of all firm observations when partitioning on the median values of 3 year GAAP ETR and volatility in three year GAAP ETR, 57.10% of all firm observations when partitioning on the median values of three-year CASH ETR and volatility in three year CASH ETR, and 46.21% of all firm observations when partitioning on the median values of 3 year CASH ETR and UTBs. Consequently, we feel that these groups deserve attention as well as

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[6] Because we need 3 years of subsequent data to compute the tax risk and the long-term effective tax rates, the observations from 2013 include data up to 2015. Hence, limiting our sample to a final year of 2013.

the firms for which the trade-off between tax avoidance and tax risk is more prevalent (groups 2 and 3).

Table 2.1 – Descriptive statistics

Panel A - Full sample GAAP ETR measures						
	N	*Mean*	*SD*	*P25*	*P50*	*P75*
GAAP ETR 3	29333	0.288	0.136	0.222	0.316	0.370
GAAP ETR 3 Vol	29333	0.083	0.098	0.017	0.044	0.117
Size	29333	6.322	2.129	4.778	6.265	7.808
Sales	29333	6.343	2.038	4.881	6.302	7.742
Leverage	29333	0.522	0.252	0.339	0.510	0.665
MtB	29333	2.865	2.338	1.415	2.177	3.438
R&D	29333	0.033	0.053	0.000	0.005	0.045
Capx	29333	0.066	0.070	0.023	0.044	0.082
Intangible	29333	0.176	0.213	0.010	0.093	0.268
ROA	29333	0.120	0.100	0.054	0.102	0.166
ROA Vol	29333	0.056	0.059	0.019	0.037	0.070
NOL	29333	0.339	0.473	0.000	0.000	1.000
Foreign	29333	0.019	0.037	0.000	0.000	0.023
Discr. Acc.	29333	0.007	0.091	-0.037	0.001	0.045
Cash Flow	29333	0.184	0.098	0.116	0.165	0.229
Loss	29333	0.048	0.214	0.000	0.000	0.000
Panel B - Full sample CASH ETR measures						
ALL	N	Mean	SD	P25	P50	P75
Cash ETR 3	26901	0.258	0.150	0.158	0.261	0.344
Cash ETR 3 Vol	26901	0.115	0.115	0.040	0.076	0.145
Size	26901	6.262	2.074	4.766	6.201	7.708
Sales	26901	6.299	1.982	4.879	6.252	7.665
Leverage	26901	0.518	0.250	0.336	0.505	0.661
MtB	26901	2.834	2.281	1.411	2.169	3.412
R&D	26901	0.033	0.053	0.000	0.006	0.046

Capx	26901	0.065	0.069	0.023	0.043	0.080
Intangible	26901	0.180	0.215	0.012	0.098	0.274
ROA	26901	0.120	0.100	0.054	0.102	0.167
ROA Vol	26901	0.055	0.058	0.019	0.037	0.069
NOL	26901	0.340	0.474	0.000	0.000	1.000
Foreign	26901	0.019	0.038	0.000	0.000	0.025
Discr. Acc.	26901	0.006	0.090	-0.038	0.001	0.044
Cash Flow	26901	0.184	0.098	0.116	0.166	0.229
Loss	26901	0.048	0.214	0.000	0.000	0.000

Panel C - Full sample UTB measure

ALL	N	Mean	SD	P25	P50	P75
UTB	6399	1.266	1.639	0.211	0.684	1.650
Size	6399	7.102	1.841	5.827	7.006	8.357
Sales	6399	6.984	1.793	5.750	6.905	8.174
Leverage	6399	0.500	0.242	0.319	0.488	0.641
MtB	6399	2.764	2.292	1.349	2.103	3.316
R&D	6399	0.040	0.056	0.000	0.016	0.062
Capx	6399	0.048	0.054	0.017	0.031	0.057
Intangible	6399	0.254	0.244	0.052	0.188	0.399
ROA	6399	0.098	0.103	0.043	0.089	0.147
ROA Vol	6399	0.057	0.061	0.018	0.037	0.072
NOL	6399	0.600	0.490	0.000	1.000	1.000
Foreign	6399	0.030	0.059	0.000	0.010	0.048
Discr. Acc.	6399	-0.009	0.092	-0.051	-0.011	0.028
Cash Flow	6399	0.160	0.093	0.101	0.144	0.202
Loss	6399	0.109	0.312	0.000	0.000	0.000

This table provides descriptive statistics of the sample.

In Table 2.2, we compare statistically the average value of the firm characteristics between the *Low-Low* group (*i.e.*, low ETRs and low tax risk) and the rest of the sample, to test which are the fundamental differences that help firms to fully benefit from their tax planning

strategy. In this case, the comparison is of particular interest because in this group the trade-off between tax avoidance and tax risk appears to be mitigated as these firms are able to have low ETR and volatility. Panel A shows results of the univariate analysis using the GAAP ETR. The subsample is significantly different from the rest of the sample across almost all the firm characteristics analyzed. These firms on average are larger, have more sales, more growth opportunities, higher return on assets, and higher cash flows. Moreover, they have higher R&D expenses, higher capital expenditures, higher foreign pre-tax income and discretionary accruals. On the other hand, the firms are characterized on average by less intangible assets, and experience fewer unprofitable years. Panel B and C present a similar univariate analysis using CASH ETR and its volatility and CASH ETR and UTB, respectively. Panel B shows results of the univariate analysis using the CASH ETR. The differences in means are very similar (compared to Panel A). The only exceptions are Leverage, Discretionary Accruals, and ROA, as the subsample of firms with low CASH ETR and low CASH ETR volatility appear to have on average higher Leverage, less discretionary accruals, and lower return on assets than the rest of the sample. Finally, Panel C presents univariate analysis comparing firms with low CASH ETR and low UTB to the other firms. These firms on average are smaller, with less sales, fewer growth opportunities, less R&D expenses, fewer intangible assets, less return on assets, less pre-tax foreign income, and less cash flow. On the other hand, they appear to be more leveraged, invest in more capital expenditures, have a more volatile return on assets, more net operating losses and more unprofitable years. The difference in the descriptives and sign of the differences between the *Low-Low* group and the rest of the sample when partitioning on UTB's can be either caused by a very different economic environment or by the fact that UTBs capture a different part of tax risk, as supported by the findings of Hutchens and Rego (2015). Hutchens and Rego (2015) examine a number of potential proxies for tax risk and find that volatility of cash ETRs and discretionary permanent book-tax differences are associated with firm risk, while UTBs and current-year additions to UTBs are not.

Table 2.2 – Univariate analysis

Panel A	Low-Low	Other		
	Mean	*Mean*	Δ	
GAAP ETR 3	0.205	0.306	-0.101	***
GAAP ETR 3 Vol	0.022	0.096	-0.074	***
Size	6.779	6.225	0.554	***
Sales	6.680	6.271	0.409	***
Leverage	0.518	0.523	-0.005	
MtB	3.397	2.752	0.645	***
R&D	0.043	0.031	0.012	***
Capx	0.068	0.066	0.002	**
Intangible	0.167	0.178	-0.012	***
ROA	0.132	0.117	0.015	***
ROA Vol	0.056	0.056	0.000	
NOL	0.342	0.339	0.003	
Foreign	0.030	0.016	0.014	***
Discr. Acc.	0.010	0.007	0.004	***
Cash Flow	0.193	0.182	0.011	***
Loss	0.029	0.052	-0.023	***
N	5105	24149		
Panel B	**Low-Low**	**Other**		
	Mean	*Mean*	Δ	
Cash ETR 3	0.138	0.306	-0.168	***
Cash ETR 3 Vol	0.038	0.146	-0.107	***
Size	6.518	6.162	0.356	***
Sales	6.422	6.251	0.171	***
Leverage	0.539	0.509	0.030	***
MtB	3.240	2.676	0.564	***
R&D	0.042	0.030	0.011	***
Capx	0.072	0.062	0.010	***

Intangible	0.184	0.179	0.005	
ROA	0.118	0.121	-0.004	**
ROA Vol	0.060	0.053	0.007	***
NOL	0.406	0.315	0.092	***
Foreign	0.024	0.018	0.007	***
Discr. Acc.	0.005	0.007	-0.002	*
Cash Flow	0.186	0.183	0.003	**
Loss	0.048	0.048	0.000	
N	7548	19353		

Panel C	Low-Low	Other		
	Mean	*Mean*	Δ	
Cash ETR 3	0.126	0.288	-0.162	***
UTB	0.275	1.556	-1.282	***
Size	6.637	7.239	-0.602	***
Sales	6.436	7.145	-0.709	***
Leverage	0.511	0.496	0.014	**
MtB	2.445	2.858	-0.413	***
R&D	0.035	0.042	-0.007	***
Capx	0.059	0.045	0.014	***
Intangible	0.232	0.260	-0.029	***
ROA	0.076	0.105	-0.029	***
ROA Vol	0.062	0.056	0.006	***
NOL	0.633	0.591	'0.042	***
Foreign	0.018	0.033	-0.015	***
Discr. Acc.	-0.006	-0.010	0.004	
Cash Flow	0.143	0.165	-0.023	***
Loss	0.137	0.101	0.037	***
N	1448	4951		

This table presents the average value of the firm characteristics between the *Low-Low* group (*i.e.*, low ETRs and low tax risk) and the rest of the sample, the difference between the means, and its statistical significance. The p-va-

lues are two tailed. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively

2.7 Empirical results

Tables 2.3, 2.4 and 2.5 present results from estimating equation (1) on the samples partitioning on GAAP ETR, CASH ETR or UTBs. Specifically, we present results using different combinations of measures that capture the level of tax avoidance and tax risk. First, we use GAAP effective tax rate measured over three years (GAAP ETR 3) to proxy for the level of tax avoidance and its volatility to measure tax risk (Table 2.3).

Table 2.3 – Multinomial logistic regression GAAP ETR 3 & GAAP ETR 3 Volatility

Dep. variables	HH→LH	HH→HL	HH→LL	HL→LH	HL→LL	LH→LL
	(1)	(2)	(3)	(4)	(5)	(6)
Size	0.289***	-0.127**	0.590***	0.416***	0.717***	0.301***
	(5.235)	(-2.162)	(7.575)	(6.431)	(8.611)	(4.599)
Sales	-0.231***	0.152**	-0.465***	-0.384***	-0.617***	-0.233***
	(-4.112)	(2.556)	(-5.854)	(-5.802)	(-7.276)	(-3.455)
Lever-age	-0.586***	-0.943***	-0.993***	0.357***	-0.0498	-0.407***
	(-5.113)	(-7.813)	(-6.724)	(2.866)	(-0.330)	(-3.354)
MtB	0.0505***	0.0411**	0.120***	0.00944	0.0792***	0.0698***
	(3.286)	(2.510)	(6.783)	(0.631)	(4.893)	(5.623)
R&D	3.901***	-4.628***	3.770***	8.529***	8.397***	-0.131
	(6.526)	(-6.417)	(4.893)	(11.58)	(9.744)	(-0.224)
Capx	-0.941**	-0.572	-1.354**	-0.369	-0.781	-0.412
	(-2.133)	(-1.250)	(-2.412)	(-0.766)	(-1.365)	(-0.874)

Intangi-ble	0.156	0.545***	-0.238	-0.389**	-0.783***	-0.394**
	(1.034)	(3.515)	(-1.164)	(-2.377)	(-3.789)	(-2.403)
ROA	-7.325***	4.139***	-2.048***	-11.46***	-6.186***	5.277***
	(-11.19)	(7.019)	(-2.723)	(-17.36)	(-8.356)	(8.972)
ROA Vol	1.869***	-6.905***	-1.017*	8.774***	5.888***	-2.886***
	(4.816)	(-13.20)	(-1.873)	(16.81)	(9.550)	(-6.171)
NOL	0.163***	-0.225***	-0.0940	0.388***	0.131*	-0.257***
	(2.986)	(-3.996)	(-1.321)	(6.764)	(1.828)	(-4.491)
Foreign	5.784***	-1.994*	7.581***	7.778***	9.575***	1.797**
	(5.651)	(-1.934)	(6.581)	(7.921)	(8.961)	(2.517)
Discr. Acc.	2.301***	0.0697	2.039***	2.231***	1.969***	-0.262
	(9.299)	(0.273)	(6.545)	(9.086)	(6.559)	(-0.981)
Cash Flow	5.014***	3.608***	4.407***	1.407**	0.799	-0.607
	(7.395)	(5.745)	(5.526)	(2.144)	(1.096)	(-1.040)
Loss	0.302***	-1.838***	-0.0860	2.140***	1.752***	-0.388***
	(3.105)	(-8.255)	(-0.647)	(9.957)	(7.453)	(-3.472)
Con-stant	-0.171	-0.156	-1.185***	-0.0152	-1.030***	-1.014***
	(-0.762)	(-0.689)	(-4.020)	(-0.0652)	(-3.455)	(-4.405)
Obser-vations	28,893	28,893	28,893	28,893	28,893	28,893
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

This table presents results from estimating equation (1) partitioning on GAAP ETR 3 and GAAP ETR 3 volatility to define the tax avoidance and tax risk quadrant.

Then we use CASH ETR and its volatility as alternative measure

(Table 2.4).

Table 2.4 – Multinomial logistic regression Cash ETR 3 & Cash ETR 3 Vola-
tility

Dep. variables	HH→LH	HH→HL	HH→LL	HL→LH	HL→LL	LH→LL
	(1)	(2)	(3)	(4)	(5)	(6)
Size	0.371***	-0.0267	0.754***	0.398***	0.781***	0.383***
	(6.468)	(-0.361)	(10.70)	(4.566)	(8.300)	(6.469)
Sales	-0.403***	0.193**	-0.696***	-0.596***	-0.889***	-0.293***
	(-6.874)	(2.524)	(-9.599)	(-6.609)	(-9.126)	(-4.752)
Leverage	0.122	-1.348***	-0.277**	1.471***	1.071***	-0.399***
	(1.070)	(-8.643)	(-2.243)	(8.231)	(5.910)	(-3.805)
MtB	0.133***	0.0990***	0.209***	0.0338*	0.110***	0.0757***
	(7.984)	(5.686)	(12.36)	(1.792)	(6.115)	(6.389)
R&D	4.120***	-5.412***	3.235***	9.532***	8.646***	-0.885*
	(6.879)	(-6.644)	(5.019)	(10.08)	(9.062)	(-1.702)
Capx	3.001***	-2.512***	2.408***	5.513***	4.920***	-0.593
	(6.518)	(-4.430)	(5.081)	(8.678)	(8.011)	(-1.413)
Intangi-ble	-0.00850	0.432**	-0.0616	-0.441**	-0.494**	-0.0531
	(-0.0556)	(2.453)	(-0.365)	(-2.093)	(-2.241)	(-0.364)
ROA	-3.366***	3.774***	-3.474***	-7.140***	-7.248***	-0.108
	(-5.945)	(5.210)	(-5.791)	(-8.846)	(-8.793)	(-0.210)
ROA Vol	2.752***	-9.288***	1.506***	12.04***	10.79***	-1.246***
	(6.839)	(-13.72)	(3.388)	(17.02)	(15.04)	(-3.359)
NOL	0.386***	-0.0266	0.440***	0.412***	0.467***	0.0549
	(6.849)	(-0.427)	(7.130)	(5.970)	(6.400)	(1.041)
Foreign	-1.531*	-1.802**	2.272**	0.271	4.073***	3.803***
	(-1.747)	(-2.133)	(2.554)	(0.255)	(3.847)	(5.170)

Discr. Acc.	-0.145	0.189	0.566**	-0.334	0.377	0.711***
	(-0.610)	(0.740)	(2.335)	(-1.174)	(1.321)	(2.998)
Cash Flow	-0.307	3.650***	2.230***	-3.957***	-1.420*	2.537***
	(-0.524)	(4.735)	(3.492)	(-4.752)	(-1.681)	(4.768)
Loss	-0.132	-0.406***	-0.360***	0.274*	0.0460	-0.228**
	(-1.383)	(-2.702)	(-3.558)	(1.748)	(0.287)	(-2.365)
Constant	-0.700***	-1.838***	-1.432***	1.138***	0.407	-0.731***
	(-3.295)	(-7.477)	(-5.870)	(4.159)	(1.403)	(-3.608)
Observations	26,901	26,901	26,901	26,901	26,901	26,901
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

This table presents results from estimating equation (1) partitioning on Cash ETR 3 and Cash ETR 3 volatility to define the tax avoidance and tax risk quadrant.

Finally, we combine Cash ETR together with another proxy for tax risk, namely the UTB (Table 2.5).

Table 2.5 – Multinomial logistic regression Cash ETR 3 & UTB.

Dep. variables	HH→LH	HH→HL	HH→LL	HL→LH	HL→LL	LH→LL
	(1)	(2)	(3)	(4)	(5)	(6)
Size	0.206	0.293**	0.0929	0.509***	0.422***	-0.0869
	(1.541)	(2.322)	(0.619)	(3.267)	(2.970)	(-0.628)
Sales	-0.574***	-0.220*	-0.254	-0.192	-0.546***	-0.354**
	(-4.212)	(-1.680)	(-1.563)	(-1.194)	(-3.705)	(-2.503)

Lever-age	0.723**	0.213	-0.0517	0.712**	1.222***	0.510*
	(2.467)	(0.748)	(-0.163)	(2.080)	(4.008)	(1.859)
MtB	-0.0314	0.0348	-0.0276	0.0906***	0.0244	-0.0662**
	(-0.984)	(1.292)	(-0.729)	(2.936)	(0.783)	(-2.189)
R&D	-3.622**	6.462***	-2.179	16.91***	6.829***	-10.08***
	(-2.369)	(5.578)	(-1.468)	(10.02)	(4.305)	(-7.278)
Capx	6.942***	2.739*	3.718**	-0.426	3.777***	4.203***
	(4.365)	(1.657)	(1.968)	(-0.255)	(2.997)	(2.596)
Intangi-ble	-0.143	-0.0426	0.0747	-0.361	-0.461	-0.1000
	(-0.440)	(-0.146)	(0.218)	(-1.015)	(-1.382)	(-0.339)
ROA	-2.118*	-2.208*	-3.313**	-2.590**	-2.500**	0.0902
	(-1.727)	(-1.821)	(-2.136)	(-2.176)	(-2.555)	(0.0778)
ROA Vol	0.666	1.857**	0.752	3.237***	2.046**	-1.191
	(0.662)	(2.008)	(0.528)	(3.389)	(2.285)	(-1.350)
NOL	0.152	0.159	-0.0271	0.375***	0.368***	-0.00757
	(1.191)	(1.398)	(-0.222)	(2.966)	(3.284)	(-0.0595)
Foreign	-4.242**	4.603***	-0.637	12.64***	3.793**	-8.844***
	(-2.513)	(3.588)	(-0.401)	(8.353)	(2.378)	(-5.775)
Discr. Acc.	-0.0941	0.118	1.891**	0.0902	-0.121	-0.212
	(-0.187)	(0.229)	(2.474)	(0.165)	(-0.252)	(-0.396)
Cash Flow	-1.662	-1.591	2.192	-2.135	-2.206**	-0.0712
	(-1.240)	(-1.271)	(1.372)	(-1.624)	(-2.001)	(-0.0560)
Loss	-0.482***	-0.357*	-0.196	-0.119	-0.244	-0.125
	(-2.730)	(-1.908)	(-0.801)	(-0.645)	(-1.504)	(-0.671)
Con-stant	2.410***	-0.717	-20.95***	-2.799***	0.328	3.127***
	(4.485)	(-1.468)	(-44.99)	(-5.403)	(0.685)	(6.435)

Obser-vations	6,399	6,399	6,399	6,319	6,319	6,319
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

This table presents results from estimating equation (1) partitioning on Cash ETR 3 and Cash ETR 3 volatility to define the tax avoidance and tax risk quadrant.

Columns (1), (2) and (3) show results with Group 4 (*High-High*) as the baseline group. Column (1) shows the likelihood of moving from the *High-High* (Group 4) to the Low tax rates-High tax rate volatility group (Group 2). That is the likelihood according to the firm characteristics in the regression to increase tax avoidance (lower ETR) although without decreasing tax risk (ETR volatility). Column (2) shows the likelihood of moving from the High tax rates-High tax rate volatility group to the High tax rates-Low tax rate volatility one (Group 3). That is the likelihood to decrease tax risk (lower ETR volatility) although without decreasing the ETR. Column (3) shows the likelihood of moving from the High tax rates-High tax rate volatility group to the Low tax rates-Low tax rate volatility one (Group 1). That is the likelihood according to the firm characteristics to increase tax avoidance (lower ETR) and at the same time decreasing tax risk (ETR volatility). Columns (4) and (5) present results with High tax rates-Low tax rate volatility group (Group 3) as the reference group. More specifically, column (4) shows the probability of moving from the High tax rates-Low tax rate volatility group to the Low tax rates-High tax rate volatility group (Group 2), that is lower ETR at the cost of increasing tax risk, while column (5) shows the probability of moving from the High tax rates-Low tax rate volatility group into the Low tax rates-Low tax rate volatility group (Group 1), that is decreasing the ETR without having to trade tax risk off. Finally, column (6) presents the likelihood of moving from the low ETR but high tax risk (Group 2) into the Low tax rates-Low tax rate group (Group 1), thus effectively decreasing tax

risk without consistently trading – off the decrease in tax burden.

Table 2.3 (Table 2.4) reports the results for our GAAP ETR (CASH ETR) sample. As expected almost all variables are statistically significant determinants of the joint tax strategy outcomes (tax avoidance and tax risk). In describing the results, our main focus will be on the difference for firms to engage in tax avoidance and how determinants explain riskiness (Column 6). These two groups of firms differ most (while controlling for the other groups) in ROA volatility and ROA level, Market to book ratio, size and sales, leverage and foreign operations. Specifically, it appears that while the it is possible for both groups to have a low three year ETR (CASH or GAAP), that the firms that are experiencing less tax risk are: larger, have fewer sales, but more foreign operations, less volatile earnings, fewer losses, and a higher growth potential. When we compare the firms that are seemingly not engaging in tax avoidance (High three-year effective tax rates, Column 2), the determining factors to have predictable/persistent tax expense are: More sales, less leverage, higher growth potential, lower R&D, more intangibles, fewer losses and specifically more cash flows, higher ROA and lower ROA volatility. It appears that the difference between these two groups is largely determined by tax risk inherent to the firms´ operations, rather than with the uncertainty of the tax strategy. While the inferences from both tables are similar, there are some noteworthy differences. As expected, discretionary accruals are less determining the tax outcomes as measured by CASH ETR (vs. GAAP ETR), this very intuitive as GAAP ETR relies on the income statement item tax expense, whereas the CASH ETR is based on the cash flow statement. The results from our UTB sample only partially agree with our more extensive samples. Two potential reasons are the obvious difference in measurement of tax risk through UTB versus ETR volatility and the difference in the time period included in the sample.

Next, we focus on the Low-Low quadrant and investigate the determinants of the likelihood of entering and maintaining the Low-Low status for at least three consecutive years.[7] Then, we look at firms´

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[7] In this analysis, we restrict the sample to firms that have entered the Low-Low

characteristics that are associated with the probability of exiting the status after three consecutive and successful years. Table 2.6 Columns (1) and (3) shows result of a logistic regression where the dependent variable equals to one when the firm enters a stream of consecutive three years of low GAAP ETR (CASH ETR) and low volatility, and zero otherwise. On the other hand, Columns (2) and (4) show the results for the exit probability using GAAP and CASH based measures, respectively. Considering the GAAP ETR, results show that the level of profitability, net operating losses, and discretionary accruals are negatively associated with the probability of enter, while there is a positive association with cash flow. On the other hand, leverage, ROA volatility, and deferred effective tax rates are negatively associated with the probability of exit, while R&D, intangibles, discretionary accruals, and unprofitable years are positively associated with the exit likelihood. Columns (3) and (4) use cash-based tax measures. Return on assets appears to be also negatively associated with the probability to enter and maintain the *Low-Low* status. Leverage and ROA volatility are negatively associated with the probability of exit, while deferred taxes are positively associated with both the likelihood of enter and exit the Low-Low status.

Table 2.6 – Determinants of the probability of Enter/Exit the Low-Low group for at least three years

Dep. variables	Enter GAAP ETR	Exit GAAP ETR	Enter Cash ETR	Exit Cash ETR
	(1)	(2)	(3)	(4)
Size	0.403***	0.286***	0.0515	0.281***
	(3.451)	(2.729)	(0.532)	(3.212)
Sales	-0.279**	-0.232**	0.122	-0.204**
	(-2.324)	(-2.198)	(1.234)	(-2.280)
Leverage	-0.0816	-0.576**	-0.0917	-0.468**

quadrant at least for one year, therefore we use them as the baseline and compare them to those firms that maintained the Low-Low status for at least three consecutive years.

	(-0.298)	(-2.128)	(-0.398)	(-2.108)
MtB	-0.00162	0.0276	0.0270	0.0322
	(-0.0641)	(1.025)	(1.231)	(1.490)
R&D	0.752	2.024*	0.866	0.471
	(0.615)	(1.744)	(0.831)	(0.471)
Capx	-1.578	1.189	-1.078	-0.196
	(-1.208)	(1.129)	(-1.129)	(-0.240)
Intangi-ble	-0.176	0.511*	0.0186	-0.0980
	(-0.623)	(1.837)	(0.0734)	(-0.412)
ROA	-3.035***	1.909	-2.324*	-0.594
	(-2.669)	(1.312)	(-1.825)	(-0.498)
ROA Vol	0.467	-11.09***	-0.966	-4.756***
	(0.462)	(-6.560)	(-0.995)	(-3.980)
NOL	-0.261**	-0.137	0.0219	0.0286
	(-2.311)	(-1.225)	(0.224)	(0.328)
Foreign	6.686***	3.485***	4.344***	2.445**
	(5.868)	(3.170)	(3.518)	(2.382)
Discr. Acc.	-1.153*	2.019***	0.0735	-1.458**
	(-1.755)	(2.866)	(0.116)	(-2.336)
Cash Flow	2.729**	-0.494	1.308	1.380
	(2.273)	(-0.351)	(1.045)	(1.165)
Deferred ETR	0.000233	-0.332***	0.181*	0.491***
	(0.00219)	(-3.167)	(1.770)	(5.185)
Loss	-1.158***	0.598**	-0.279	-0.485
	(-3.011)	(2.015)	(-0.976)	(-1.563)
Constant	-4.964***	-2.897***	-4.681***	-3.877***
	(-9.897)	(-6.910)	(-12.13)	(-11.14)

Observa-tions	14,310	14,691	17,264	17,521
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

This table shows result of a logistic regression where the dependent variable equals to one when the firm enters (exists) a stream of consecutive three years of low GAAP ETR (CASH ETR) and low volatility, and zero otherwise.

Overall, we perform some preliminary analyses that indicate significant differences in the determinants for tax strategy dimensions, tax risk and tax avoidance, when they are examined jointly. More extensive research will be needed to provide conclusive evidence of the differences between determinants that lead to the joint incidence of tax avoidance and tax risk. Nevertheless, our results indicate that it is possible to attain tax avoidance strategies that inhibit tax risk.

2.8 Conclusion

In this study, we analyze the determinants of firms´ tax planning strategies, both in terms of tax avoidance and tax risk. The immediate benefits from engaging in tax planning translates into lower current tax burden and cash tax savings. Nevertheless, a tax benefit today might not be sustainable and could reverse in the future as it might be challenged by the tax authorities. While most studies focus on a specific combination of the two tax planning dimensions, specifically, the trade-off between tax avoidance and tax risk, we follow Drake et al. (2019), whose results suggest that the tax strategy dimensions, tax avoidance and tax risk, are separate concepts that should be examined simultaneously. Specifically, we aim to contribute to understanding the determinants of joint tax outcomes along the tax avoidance and tax risk dimensions. Previous literature has developed different measures of tax risk, namely the volatility of the effective tax rate (Guenther et al., 2016) and the unrecognized tax benefits (Lisowsky, 2010;

Blouin et al., 2012; Rego & Wilson, 2012; Beck & Lisowsky, 2013; Lisowsky et al., 2013; Hanlon et al., 2017; Ciconte et al., 2024). Measuring tax avoidance by effective rates and tax risk by volatility in effective rates, we focus on the characteristics that lead to any potential tax outcome (combination of the two tax strategy dimensions). Specifically, we focus on four different groups of firms, classified according to their tax outcomes (high vs. low level of tax avoidance and high vs. low tax risk). We aim to provide evidence that reveals which firms are able to benefit from low tax rates without increasing tax risk and find support for the under-sheltering puzzle by pinpointing determinants of high tax rates (combined with high tax risk). Overall, we follow Drake et al. (2019) whose results suggest that the tax strategy dimensions, tax avoidance and tax risk, are distinct constructs that should be measured separately and follow their recommendation of examining tax avoidance and tax risk simultaneously, rather than in isolation. We contribute to the literature by treating tax avoidance and tax risk as two separate dimensions, while several more recent studies (e.g. Neuman, 2016) look at tax strategies that pursue minimization versus sustainability (proxied by a combination of the concepts of tax avoidance and tax risk).

Our preliminary results indicate significant differences in the determinants for tax strategy dimensions, tax risk and tax avoidance, when they are examined jointly. Specifically, our current main focus is on the difference for firms to engage in tax avoidance and how determinants explain riskiness. It appears that while it is possible for both groups to have a low three-year ETR (CASH or GAAP), that the firms that are experiencing less tax risk are: larger, have fewer sales, but more foreign operations, less volatile earnings and a higher growth potential. When we compare the firms that are seemingly not engaging in tax avoidance (High three year effective tax rates), the determining factors to have predictable/persistent tax expense are: higher sales, less leverage, higher growth potential, lower R&D, more intangibles, fewer losses and specifically more cash flows, higher ROA and lower ROA volatility. It appears that the difference between these two groups is largely determined by tax risk inherent to firms' opera-

tions, rather than with the uncertainty of the tax strategy. Overall, we provide some preliminary insights into determinants of different tax strategy outcomes.

Appendix 2.A

Variable definition	
Tax variables	
GAAP ETR 3	The three-year sum of income taxes (TXT) divided by the three-year sum of pre-tax income minus special items (PI - SPI). The three years cover from the current year t to the following two years (t + 1 and t + 2). The variable is bounded between 0 and 1.
CASH ETR 3	The three-year sum of taxes paid (TXPD) divided by the three-year sum of pre-tax income minus special items (PI - SPI). The three years cover from the current year t to the following two years (t + 1 and t + 2). The variable is bounded between 0 and 1.
GAAP ETR 3 Vol	The three-year volatility of *GAAP ETR 3* from the current year t to the following two years (t + 1 and t + 2).
CASH ETR 3 Vol	The three-year volatility of *CASH ETR 3* from the current year t to the following two years (t + 1 and t + 2).
UTB	TXTUBEND scaled by lagged total assets.
Deferred ETR	Following Edwards et al. 2016, we compute deferred taxes as (TXDFED+TXDFO)/(PI -SPI).
Firm – level control variables	
Size	The natural logarithm of the firm's total assets (AT).
Sales	The natural logarithm of the firm's sales (SALE).
Leverage	Total debt (DLC + DLTT) scaled by total assets (AT).
MtB	The market-to-book ratio calculated as common shares outstanding (CSHO) multiplied by the stock price at the fiscal year-end (PRCC_F) divided by total common equity (CEQ).
R&D	R&D expenses (XRD) scaled by total assets (AT) at the beginning of the year.

Capx	Capital expenditures (CAPX) scaled by total assets (AT) at the beginning of the year.
Intangible	Intangible assets (INTAN) scaled by total assets (AT) at the beginning of the year.
Pre-Tax ROA	The pre-tax ROA.
σ(ROA)	The three-year volatility of Pre-Tax ROA.
NOL	An indicator variable equal to one if the firm has net operating loss carryforwards and zero otherwise.
Foreign	Pre-tax foreign income (PIFO) scaled by total assets (AT) at the beginning of the year.
Discr. Acc.	Discretionary accruals calculated by industry-year (2-digit SIC code) using the Modified Jones model.
Cash Flow	EBITDA scaled by lagged total assets.

Chapter 3 Capital structure and tax incentives

3.1 Overview

The chapter explores the intricate relationship between taxes, tax incentives, and corporate capital structure decisions, focusing on how firms navigate the trade-offs between the benefits and risks of debt financing. Central to this analysis is the concept of the interest tax shield, which provides firms with tax advantages by allowing interest expenses to be deducted from taxable income. This creates a strong incentive for firms to favor debt over equity financing. However, the benefits of debt must be weighed against the risks of financial distress and bankruptcy, as highlighted by trade-off theory. Firms with stable earnings and tangible assets are more likely to rely on debt, while those with riskier profiles or intangible assets tend to avoid high leverage.

The chapter also examines the role of non-debt tax shields, such as depreciation and investment tax credits, which can substitute for the tax advantages of debt. Firms with significant non-debt tax shields may rely less on debt financing, as these mechanisms reduce taxable income without increasing financial risk. Despite the theoretical clarity of these models, empirical evidence remains mixed. Puzzles such as debt conservatism and the inverse relationship between profitability and leverage challenge traditional theories. For instance, while trade-off theory predicts that profitable firms should use more debt to maximize tax deductions, empirical studies often show the opposite.

A key focus of the chapter is the impact of the thin capitalization

rule introduced in Italy in 2008, which limited the deductibility of interest expenses to 30% of a firm's adjusted EBITDA. This reform aimed to reduce the tax bias favoring debt financing and align Italy's tax system with international best practices. The analysis reveals that firms responded to the reform by reducing their debt ratios, thereby decreasing their reliance on the debt tax shield. Interestingly, the evidence also suggests that firms increased their use of tax avoidance strategies to compensate for the reduced tax benefits of debt.

The chapter highlights the broader implications of tax policy on corporate behavior. By altering the relative costs and benefits of different financing options, tax reforms can significantly influence firms' capital structure decisions. For example, the Italian reform not only reduced leverage but also prompted firms to explore alternative strategies for minimizing their tax burdens. This underscores the interconnectedness of tax policy, corporate finance, and strategic decision-making.

Overall, the chapter provides a comprehensive analysis of the factors influencing capital structure decisions, emphasizing the role of taxes and tax incentives. It contributes to the literature by addressing unresolved puzzles and offering insights into how firms adapt to changes in tax policy. The findings have important implications for policymakers, as they highlight the need for a balanced approach that considers the trade-offs between encouraging investment, ensuring tax compliance, and maintaining financial stability.

3.2 Taxes, Tax Incentives, and Capital Structure Decisions

The effect of taxes and tax incentives on capital structure decisions has been a central focus of both theoretical and empirical research. The tax sensitivity of capital structure is primarily grounded in the theoretical benefits of debt, particularly the interest tax shield. This concept highlights how tax systems inherently favor debt financing over equity financing because interest expenses are deductible from corporate taxable income, while equity payouts, such as dividends, are not. Modigliani and Miller (1963) were among the first to demonstrate how this tax advantage affects firm value, showing that the value of

the interest tax shield rises with the marginal tax rate. Higher corporate tax rates amplify the tax savings from debt financing, making leverage more attractive and reducing the effective cost of debt. This creates a strong incentive for firms to rely more heavily on debt in their capital structure.

However, while the tax benefits of debt are significant, they are not the sole determinants of capital structure decisions. Firms must balance these benefits against the potential costs of financial distress and bankruptcy, which increase as leverage rises. Trade-off theory encapsulates this balance, proposing that firms aim to achieve an optimal capital structure by weighing the tax advantages of debt against the costs of financial distress. These costs can be both direct—such as administrative expenses, legal fees, and time spent managing bankruptcy—and indirect, including damage to a firm's reputation, loss of intangible assets, and agency conflicts between equity and debt holders (Jensen & Meckling, 1976; Myers, 1977). Consequently, trade-off theory predicts that firms with safe, tangible assets and substantial taxable income to shield will maintain higher target debt ratios, while firms with risky, intangible assets will rely more on equity financing. Empirical evidence partially supports this view; for instance, Mackie-Mason (1990) found that tax-paying firms are more likely to issue debt than non-tax-paying firms. However, other studies, such as Fama and French (1998), have failed to find conclusive evidence that interest tax shields significantly contribute to firm value.

In addition to the interest tax shield, trade-off models suggest that non-debt tax shields can act as substitutes for debt tax shields, thereby reducing the tax advantages of debt. Non-debt tax shields include mechanisms such as accelerated depreciation, investment tax credits, and more aggressive strategies like tax shelters. Graham and Tucker (2006) demonstrated that firms engaging in tax sheltering activities tend to rely less on debt, supporting the notion that non-debt tax shields can replace debt tax shields. This substitution effect underscores the strategic interplay between different tax shields and highlights the importance of tax planning in shaping corporate financing decisions.

Despite the theoretical clarity of these models, empirical evidence on the tax sensitivity of capital structure remains mixed. Graham and Leary (2011) observed that existing determinants of leverage struggle to explain its variation, with their explanatory power declining over time. Most of the variation in leverage is cross-sectional within industries rather than across industries, and standard proxies fail to explain within-firm variation effectively. Furthermore, the inverse relationship between leverage and profitability—a key unresolved issue—contradicts trade-off theory, which predicts that profitable firms should use more debt to maximize tax deductions. Graham (2000) estimated that 44% of firms could double their debt levels and still fully benefit from interest tax deductions. This finding has been used to support the *debt conservatism puzzle*, or *tax-undersheltering puzzle*, which suggests that many firms do not take full advantage of the tax benefits associated with optimal debt levels.

An alternative explanation to trade-off theory is provided by the pecking order theory, introduced by Myers and Majluf (1984). According to this view, firms prioritize internal financing due to the high adverse selection costs of issuing equity. Debt is only used when internal funds are insufficient, and equity is considered a last resort. This hierarchical preference persists even when other frictions, such as transaction costs, taxes, agency costs, and managerial optimism, are taken into account (Stiglitz, 1973; Heaton, 2002; Myers, 2003). The pecking order theory provides a plausible explanation for the debt conservatism puzzle, suggesting that firms may rely on alternative strategies to reduce their tax burden without increasing leverage.

Faccio and Xu (2015) employ a variety of data sources to identify changes in the top statutory corporate tax rate and the marginal personal statutory tax rates on interest and dividend income across OECD countries from 1981 to 2009. They exploit tax changes to assess the effects of taxes on capital structure and find evidence indicating that both corporate and personal taxes are significant determinants of capital structure choices. They document that firms tend to increase leverage following an increase in corporate taxes or personal taxes on dividend income, while they tend to reduce leverage following an

increase in personal taxes on interest income. The magnitude of the tax effects is comparable to that of traditional capital structure determinants documented in the literature (e.g., firm size).

Measurement issues and reporting biases further complicate the study of capital structure decisions. Hanlon and Heitzman (2010) noted that accounting rules often allow firms to report economic liabilities off-balance sheet, leading to an underestimation of true leverage ratios and biased tax sensitivity results. Additionally, the confidentiality of taxable income data in many countries necessitates estimations, which can distort the measurement of tax incentives and debt characteristics. Feld et al. (2013) concluded that taxes positively influence capital structure choices after accounting for econometric misspecification biases and variable mis-measurement. These findings highlight how financial reporting practices can significantly alter the observed relationship between taxes and capital structure.

In conclusion, while debt financing offers substantial tax advantages through the interest tax shield, firms must balance these benefits against the risks of financial distress and bankruptcy. Trade-off theory provides a useful framework for understanding this balance, but its predictions are challenged by empirical inconsistencies, alternative explanations like the pecking order theory, and the debt conservatism puzzle. Mixed evidence underscores the complexity of capital structure decisions, influenced by factors such as non-debt tax shields, measurement issues, and reporting biases. These challenges highlight the need for further research to reconcile theoretical predictions with observed corporate behavior.

3.3 Theoretical background and hypothesis development

The OECD's Base Erosion and Profit Shifting (BEPS) Project outlines key tactics multinational corporations use to lower their global tax liabilities and offers targeted recommendations to counter these practices. Action 4 advises countries to restrict interest deductions to address the strategic allocation of third-party debt in high-tax jurisdictions and intragroup loans designed to shift income.

As a consequence, many nations have implemented measures to limit the deductibility of interest. The European Union's Anti-Tax Avoidance Directive 2016/1164 emphasizes that the interest limitation rule is essential to deter profit shifting by restricting the deductibility of borrowing costs, further stating that a fixed ratio based on a taxpayer's EBITDA (earnings before interest, tax, depreciation, and amortization) is necessary. As of now, all OECD countries, except Israel, have adopted measures to limit interest deductibility (Hanlon and Heitzman, 2022). These rules primarily target related-party debt, aligning with the OECD's focus on preventing multinational enterprises from exploiting cross-border tax discrepancies to shift income. Additionally, 80% of OECD countries also impose restrictions on interest deductions for third-party debt.

Studies on the interest barrier have investigated national reforms that introduced limited interest deductibility. A recent working paper by Bilicka et al. (2021) finds that UK multinationals subject to the UK's recent limit on interest deductibility end up shifting both debt and real operations out of the UK. Alberternst and Sureth (2015) find evidence consistent with German firm subject to interest deductibility limits reduced leverage by three percentage points more than companies not subject to the limitations.

In the U.S., recent changes to corporate tax laws under the Tax Cuts and Jobs Act (TCJA) introduced a substantial shift in tax incentives related to debt financing through: (a) a significantly reduced corporate income tax rate, (b) the removal of U.S. taxes on most foreign profit repatriations, theoretically resulting in reduced borrowing within the U.S., and (c) explicit restrictions on the deductibility of interest. Specifically, the TCJA restricted tax deductions for interest expenses exceeding 30% of profits.

Recent research shows mixed results, with some studies reporting significant debt responses, while others find none. Hanlon and Heitzman (2024) propose that affected firms already have strong incentives to reduce leverage due to diminishing marginal tax benefits (e.g., net operating loss rules) and increasing marginal costs (e.g., loan covenants). Aligning with the notion that interest exceeding 30% of profits

signals overleverage, they observe firms reducing debt in response to high interest-to-profit ratios over a 28-year period prior to the TCJA. Post-TCJA, firms subject to the 30% limitation slightly reduced their debt more than before, but only when their need for external financing was low. Their findings suggest that the interest deductibility cap had a modest impact on financing decisions, primarily affecting firms where excess interest posed the least financial risk.

3.3.1 The Italian background

Italy's tax treatment of financing costs underwent three major reforms that reflect a shift in taxation policy, moving from a dual income tax system in 1997 to the thin capitalization rules in 2003, and finally to a German-inspired regime introduced in 2008[8]. The 2008 Budget Law set a cap for the deduction of financing costs at 30% of a company's adjusted EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization).

In 1997, Italy introduced the Dual Income Tax (DIT) system to reduce the tax bias favoring debt over equity financing. The DIT distinguished between "normal income" (a notional return on equity taxed at a lower rate) and "residual income" (profits exceeding this return, taxed at the standard rate). This reform incentivized equity financing, promoting financial stability and reducing corporate reliance on debt, aiming at enhancing tax neutrality, encourage investment, and support economic growth.

The Thin Capitalization Rules repealed the dual income tax and limiting the deduction of financing costs for debt exceeding a 4:1 debt-to-equity ratio if the debt was granted or guaranteed by a qual-

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[8] Scheunemann and Muller-Duttine (2007) highlight some key differences between the German system and the Italian system. Notably, in Germany a yearly allowance for the first million of interest expenses has been acknowledged. Moreover, if the financed business is not a full or proportional member of a consolidated group, the interest barrier generally does not apply and the full deduction of interest expense is ensured. An escape clause has been granted to consolidating groups: when the ratio equity/assets of each company within the group is equal or higher than the ratio equity/ assets at the group level, the interest barrier does not apply. Missing that ratio by up to 1 per cent is not detrimental (tolerance limit).

ified shareholder or related party. The rules applied to all forms of financing, including loans, cash deposits, and financial leases. However, exemptions were provided if the debt met an "arm's length" standard (*i.e.*, if a third party would have provided the same loan under similar conditions). The regime was complex and difficult to enforce, especially for large groups with intricate financial structures. Moreover, the 4:1 ratio was considered too high to deter thin capitalization practices effectively. At the same time, the Italian tax system introduced the dividend/participation exemption regime, together with a rule limiting deduction in order to avoid the possible enjoyment of a double tax advantage through the acquisition of participations generating no taxable income with acquisition debt bearing deductible interest (*i.e., pro rata patrimoniale*). Overall, compliance costs and litigation risks were high, and the system was seen as inequitable.

The 2008 Budget Law addressed criticism of the thin capitalization rules by introducing a simplified tax system. It reduced complexity, eased compliance burdens, and aligned with global practices by capping financing cost deductions at 30% of adjusted EBITDA, replacing the previously ineffective and intricate regulations. The reform introduced a significant shift in the tax treatment of financing costs by establishing a uniform rule applicable to all corporate taxpayers. Unlike the previous thin capitalization rules, which primarily targeted inter-company loans, the new regulation applies irrespective of the relationship between the lender and borrower. This universal applicability ensures a more neutral and straightforward approach. The reform also redefined EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) as the difference between production value and costs, adjusted for depreciation, amortization, and lease expenses. Notably, financing costs, passive income such as dividends, and capital gains are excluded from this calculation, creating a more focused and operationally relevant metric.

To address situations where taxpayers cannot fully utilize their financing cost deductions, the reform introduced carried-forward provisions. Unrelieved financing costs can be carried forward indefinitely, allowing companies to deduct them in future years, provided they

remain within the 30% of adjusted EBITDA cap. Similarly, any unused EBITDA capacity, or excess deduction allowance, can also be carried forward to offset financing costs in subsequent tax periods. These measures provide flexibility for businesses to manage fluctuations in profitability, ensuring that the deduction cap does not unduly penalize companies with variable earnings or financing structures.

Moreover, the Law introduced a significant reduction in corporate tax rates, lowering the corporate income tax (IRES) from 33% to 27.5% and the regional tax on productive activities (IRAP) from 4.25% to 3.9%. These measures aimed to make the Italian tax system more competitive internationally and to encourage investments. However, alongside the reduction in tax rates, the reform also expanded the corporate tax base, thereby balancing the overall fiscal impact.

One of the most notable aspects of this tax base expansion was the elimination of the option to apply accelerated depreciation and amortization. Previously, companies were allowed to accelerate the tax deduction of costs related to depreciation and amortization, thereby reducing their taxable income more quickly. With the reform, this practice was abolished, requiring businesses to follow a standard and more gradual depreciation schedule. This change effectively increased the annual taxable income of companies, partially offsetting the revenue loss resulting from the reduced tax rates.

3.3.2 Hypothesis development

Under the 2008 Italian Budget Law, a significant change was introduced regarding the deductibility of interest expenses. According to the new rule, non-deductible interest expenses could be carried forward to future fiscal years, allowing companies to offset them against taxable income in later periods. While this provision offers a degree of flexibility, it has notable implications for the value of the tax shield provided by debt financing.

The key issue lies in the net present value (NPV) of the tax shield. Under the previous system, where interest expenses were immediately and fully deductible, firms could realize the tax savings associated with debt financing in the same fiscal year. This immediate deduction

maximized the NPV of the tax shield because the savings were not subject to any delay. However, under the new rule, the deferral of the deduction to future years reduces the NPV of the tax shield due to the time value of money—future tax savings are worth less in present terms compared to immediate savings.

This reduction in the attractiveness of the tax shield diminishes one of the primary financial incentives for firms to use debt financing. The tax shield is a critical factor in determining the optimal capital structure of a firm, as it reduces the effective cost of debt. With the reform decreasing the benefits of this shield, the relative cost of debt increases compared to equity financing. Consequently, firms are expected to adjust their capital structures by reducing leverage (*i.e.*, relying less on debt and more on equity financing).

In summary, the limitation on the immediate deductibility of interest expenses under the 2008 reform weakens the tax advantages of debt, prompting firms to reconsider their reliance on leverage. This shift aligns with the broader objectives of the reform, which aimed to broaden the corporate tax base and reduce the distortions in financing decisions caused by tax incentives. Therefore, I expect firms to decrease leverage after the introduction of the reform, leading to the following hypothesis:

H1: *Firms decrease the amount of debt following the introduction of the interest barrier.*

The introduction of the interest barrier has critical implications for firms with high leverage and substantial interest expenses. To illustrate, consider a firm with interest expenses of 100 and an EBITDA of 200. The firm's interest-to-EBITDA ratio stands at 50%, which exceeds the 30% threshold established by the reform. Under the new rule, the firm can only deduct interest expenses up to 30% of EBITDA, which amounts to 60. The remaining 40 of interest expenses cannot be deducted in the current year and must be carried forward. This means that 40% of the firm's interest expense does not contribute to the tax shield of debt in the current period, reducing the immediate tax benefits associated with debt financing.

The inability to deduct interest expenses above the threshold reduc-

es the net present value (NPV) of the tax shield, as future tax savings are less valuable than immediate ones due to the time value of money. Consequently, the effective cost of debt increases for firms with high levels of non-deductible interest expenses. This change creates a disincentive for firms to rely heavily on debt financing, as the reduced tax shield diminishes one of the primary financial advantages of leverage. Firms that consistently exceed the 30% EBITDA threshold will face greater reductions in the tax shield of debt, making debt financing less attractive. As a result, these firms are likely to adjust their capital structures by reducing leverage to mitigate the financial impact of the reform

> H2: *The decrease in leverage is expected to be more pronounced for firms with a higher proportion of non-deductible interest expenses.*

The broadening of the tax base can have unintended consequences, as firms may respond by seeking alternative strategies to reduce their tax burdens, potentially leading to an increase in tax avoidance activities (Dyreng et al., 2022). Tax avoidance allows firms to lower their effective tax rates, which can become a more attractive strategy when other tax benefits, such as the debt tax shield, are diminished. With reduced reliance on debt to lower taxable income, firms may experience higher pre-tax profits, which in turn increases the marginal benefit of engaging in tax avoidance. This dynamic creates stronger incentives for firms to explore and implement tax avoidance mechanisms, such as income shifting, exploiting loopholes, or utilizing tax havens.

The shift in behavior is driven by the need to offset the increased tax liabilities that arise from a broader tax base. Firms are likely to weigh the costs and risks associated with tax avoidance against its potential benefits, and as the marginal benefit grows, so too does the likelihood of adopting such strategies. Ultimately, while broadening the tax base aims to increase tax revenues and reduce distortions, it may inadvertently encourage firms to engage in more aggressive tax planning, undermining the intended policy outcomes. This leads to the following hypothesis:

> H3: *Firms increase tax avoidance following the introduction of the interest barrier.*

3.4 Variable measurement and empirical research design

To investigate the effect of the introduction of the interest barrier, I perform a difference-in-difference analysis around the event (*i.e.*, 2008). The analyzed time window goes from year t-2 to t+2, where t is the year of the event, that is from 2006 to 2010. The estimated equation is the following:

$$Leverage_{i,t} = \alpha + \beta_1 \, Treatment + \beta_2 \, Post \, Reform + \beta_3 \, \text{Treatment x Post Reform}_{i,t}$$
$$+ \beta_4 \Sigma \, Firm \, Controls_{i,t} + Industry - Year \, FE + Firm \, FE + \varepsilon_{i,t} \qquad Eq. (1)$$

Leverage is the dependent variable and it computed as total debt (the sum of current and long-term liabilities) over total assets. The treated firms are defined as firms with an interest to EBITDA ratio in 2007 above the 30% threshold, namely the firms that are in fact affected by the limitation of the interest deductibility. I define the treatment in the year before the reform to account for any anticipation effect. The remaining firms work as control group.

Moreover, I perform an entropy balance matching and the equation is estimated with analytical weights computed on several firm characteristics, namely size, tangible assets, profitability, turnover, and industry. The interaction between *Treatment* and the time variable *Post Reform* is the variable of interest as it describes the incremental effect of the reform on the treated firms. Firm-level control variables include Tangibles, which is defined as tangible assets to lagged total assets, *ROA* is the ratio of EBIT over total assets, *ROA Vol.* is the standard deviation of *ROA* over the past three years, Employees is the natural logarithm of the number of employees, *Age* is the natural log of the firm age in years, *Size* is the natural log of total assets, *Turnover* is defined as the natural log of net sales, *Wages* is the natural log of the cost of employees, current ratio is the ratio of current assets to current liabilities, *NDTS* is the non-debt tax shield following Bradley et al. (1984), and it is defined as depreciation scaled by total assets, carryforward is a dummy variable equal 1 is the firm experienced a loss in the previous year, therefore it can benefit from a tax refund, and zero

otherwise. *Parent_Italy* is an indicator variable equal one if the firm is owned by an Italian company, and zero otherwise.

In addition, to test H3, I estimate the following regression:

$$ETR = \alpha + \beta_1\ Treatment + \beta_2\ Post\ Reform + \beta_3\ Treatment\ x\ Post\ Reform_{i,t} + \beta_4\ \sum Firm\ Controls_{i,t} + Industry - Year\ FE + Firm\ FE + \varepsilon_{i,t} \qquad Eq.(2)$$

where ETR is the GAAP effective tax rate computed as income tax expense over pretax income. Both models include Industry-Year fixed effect and Firm fixed effects and cluster standard errors at the firm-level. All continuous variables are winsorized at the first and 99th percentiles.

3.5 Data and sample

This study employs the Amadeus dataset from Bureau van Dijk over the period 2003 – 2014 and links the accounting information with the ownership data of parent firms and their subsidiaries. As the Amadeus database only provides ownership information for the last reported date, the study relies on previous versions of Amadeus to track changes in the ownership structure. If a firm's ownership data were not included in earlier versions of Amadeus, the most recent information for the entire sample period is taken into account. If the ultimate owner is an Italian company, the firm is considered domestic. These firms can be standalone firms or firms that belong to a domestic group with no foreign affiliates or foreign global ultimate owner.

Consistent with prior tax avoidance studies, financial institutions (USSIC from 6000–6999) and utility firms (USSIC codes 4900–4999) are dropped from the sample. All firm–year observations with missing data required to compute the control variables used in the analysis are also dropped. The final sample for the main analysis consists of 125,823 firm–year observations. Table 3.1 presents descriptive statistics for the overall sample.

Table 3.1 Descriptive statistics

	N	Mean	SD	0.25	Median	0.75
Leverage	125823	0.721	0.207	0.594	0.771	0.889
Treatment	125823	0.289	0.453	0.000	0.000	1.000
Tangibles	125823	0.294	0.265	0.083	0.217	0.432
ETR	125823	0.489	0.316	0.324	0.483	0.741
ROA	125823	0.059	0.082	0.019	0.046	0.086
ROA Vol	125823	0.036	0.037	0.012	0.024	0.046
Employee	125823	2.838	1.266	2.079	2.708	3.664
Age	125823	2.843	0.662	2.364	2.941	3.338
Size	125823	15.286	1.350	14.290	15.166	16.179
Turnover	125823	15.334	1.339	14.360	15.188	16.221
Wages	125823	13.353	1.341	12.483	13.226	14.222
Current Ratio	125823	1.590	1.186	1.027	1.254	1.720
NDTS	125823	0.034	0.030	0.014	0.026	0.045
Carryforward	125823	0.167	0.373	0.000	0.000	0.000
Parent_Italy	125823	0.933	0.250	1.000	1.000	1.000

This table presents descriptive statistics.

3.6 Empirical results

The estimation model consists in a difference-in-difference analysis detailed in equation (1). The coefficient of interest is the difference-in-difference coefficient b_3. To better address potential endogeneity issues in our research design given our identification strategy relies on the ex-ante debt structure, a recently developed multivariate matching approach is used (entropy balancing) to identify weights for the control sample to equalize the distribution of determinants across treatment and control samples (Hainmueller & Xu, 2013).

Table 3.2 presents results for estimating equation (1). In Column (1), the control variables are excluded, while the specification includes firm FE and Industry-Year FE. Column (2) includes all the control variables but only Industry-Year FE, while Column (3) includes all the control variables, Industry-Year FE, and firm FE.

Table 3.2 – The effect of the interest barrier on leverage

Dependent variable	Leverage	Leverage	Leverage
	(1)	(2)	(3)
Treatment		0.0820***	
		(42.95)	
Treat x Post Reform	**-0.00437******	**-0.0102******	**-0.00587******
	(-2.595)	**(-6.451)**	**(-3.807)**
Tangibles		-0.235***	-0.138***
		(-54.15)	(-26.49)
ROA		-0.376***	-0.237***
		(-32.13)	(-23.45)
ROA Vol		-0.405***	-0.0131
		(-16.47)	(-0.590)
Employee		0.0123***	0.00504***
		(6.143)	(2.722)
Age		-0.0405***	0.0369***
		(-28.02)	(5.770)
Size		-0.0226***	0.0162***
		(-13.44)	(3.759)
Turnover		0.00753***	0.00686***
		(4.482)	(3.861)
Wages		-0.00387*	0.00780***
		(-1.799)	(3.153)

|			
Current Ratio		-0.0903***	-0.0382***
		(-56.29)	(-24.59)
NDTS		-0.0223	-0.117***
		(-0.664)	(-2.877)
Carryforward		0.0103***	0.0145***
		(5.909)	(13.81)
Parent_Italy		0.00114	
		(0.309)	
Constant	0.738***	1.239	1.173***
	(758.1)	(0.00200)	(19.60)
Industry-Year FE	Yes	Yes	Yes
Firm FE	Yes	No	Yes
Observations	125,823	125,823	125,823
R-squared	0.917	0.496	0.930

This table presents results for estimating equation (1). In Column (1), the control variables are excluded, while the specification includes firm FE and Industry-Year FE. Column (2) includes all the control variables but only Industry-Year FE, while Column (3) includes all the control variables, Industry-Year fixed effects, and firm fixed effects. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles.

The interpretation of the results detailed in Table 3.2 relies on the assumption of parallel trends. This assumption posits that in the absence of changes brought by the reform, the average change in leverage for both the treatment and control firms would have been similar (Clarke & Schythe, 2021; Armstrong et al., 2022). Therefore, to validate the results from testing Equation (1), I analyze the time dynamics of leverage around the implementation of the thin capitalization reform by estimating Equation (1) and incorporating two-year leads and lags from *Post*. This approach allows us to determine whether there is any

anticipation of changes in employment protection laws and if firms postpone their tax avoidance responses.

Results are presented in Figure 1, which provides a direct visualization of this analysis. The results presented in Figure 3.1 confirm that the counterfactual treatment effects in the period prior to the reform are statistically comparable to those observed in the benchmark period, thus providing formal validation of the parallel trend assumption. This corroborates the interpretation of the main results.

Figure 3.1 - Parallel Trends representation.
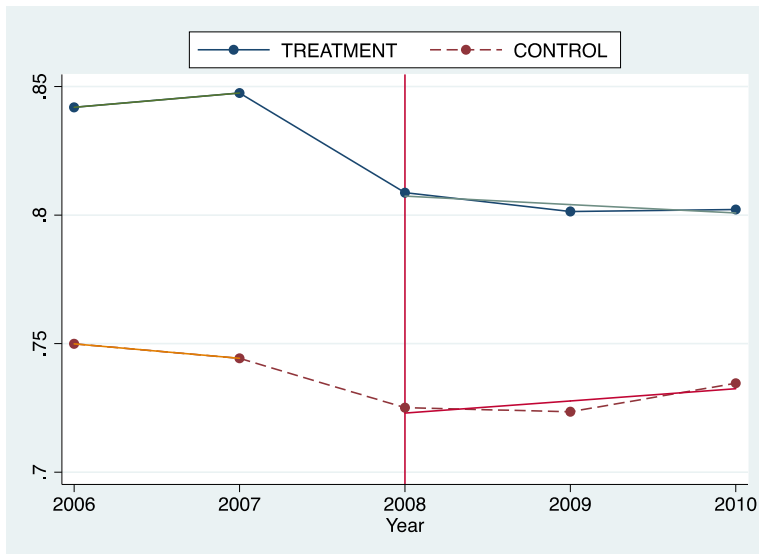
This figure shows results of the test for the Parallel Trends assumption.

To test H2, I analyze within the sample of treated firms, which one reduced their leverage the most. Following the definition of treated firm, I split them into deciles according to their interest to EBITDA ratio in the year before the reform was introduced. I define *High* equal to one if the firm is above the fourth decile of the interest to EBITDA ratio distribution in 2007, and zero otherwise. Preliminary analysis of the difference in means show that the decrease in leverage is stronger for firms in the upper half of the distribution.

Moreover, I perform a triple difference-in-difference where the coefficient of interest is the interaction term *Treat x Post Reform x High Debt.* Table 3.3 presents results of the DDD estimation and shows a negative and statistically significant coefficient of interest. Moreover, the linear combination of the sum of *Treat x Post Reform* and *Treat x Post Reform x High Debt* is also statistically significant, suggesting that the companies in the upper end of the distribution of treated firms (*i.e.*, firms with interest to EBITDA ratio in 2007 above the median) incrementally reduce leverage following the introduction of the interest barrier.

Table 3.3 – High leverage firms

Dependent variable	Leverage	Leverage	Leverage
	(1)	(2)	(3)
Treatment		0.0587***	
		(22.53)	
Treat x Post Reform	0.000637	-0.00478**	-0.00212
	(0.278)	(-2.210)	(-1.018)
High Debt		0.0371***	
		(13.57)	
Treat x Post Reform x High Debt	**-0.00770*****	**-0.00781*****	**-0.00579****
	(-2.943)	**(-3.255)**	**(-2.405)**
Tangibles		-0.234***	-0.138***
		(-54.04)	(-26.49)
ROA		-0.366***	-0.237***
		(-31.71)	(-23.34)
ROA Vol		-0.397***	-0.0133
		(-16.23)	(-0.600)
Employee		0.0122***	0.00500***

		(6.132)	(2.699)
Age		-0.0407***	0.0367***
		(-28.27)	(5.731)
Size		-0.0237***	0.0162***
		(-14.08)	(3.772)
Turnover		0.00767***	0.00680***
		(4.574)	(3.831)
Wages		-0.00302	0.00777***
		(-1.414)	(3.142)
Current Ratio		-0.0894***	-0.0382***
		(-55.92)	(-24.58)
NDTS		0.00562	-0.115***
		(0.167)	(-2.825)
Carryforward		0.00754***	0.0146***
		(4.351)	(13.88)
Parent_Italy		0.000682	
		(0.185)	
Constant	1.397***	1.167***	1.174***
	(1,434)	(53.06)	(19.61)
Industry-Year FE	Yes	Yes	Yes
Firm FE	Yes	No	Yes
Observations	125,823	125,823	125,823
R-squared	0.917	0.499	0.930

This table presents results for estimating equation (2). In Column (1), the control variables are excluded, while the specification includes firm FE and Industry-Year FE. Column (2) includes all the control variables but only Industry-Year FE, while Column (3) includes all the control variables, Industry-Year fixed effects, and firm fixed effects. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles.

3.6.1 Robustness tests

To test whether results are not driven by any concurrent macro-economic trend, I perform additional placebo tests around different time events. If the reform in 2008 is responsible for the decrease in leverage, then results should be sensitive to the time-window and I should find no statistically significant results. For instance, I estimate equation (1) around the year 2009, keeping a 5-year window (*i.e.*, from 2007 to 2011). Then, I use other time windows around the placebo years 2010, 2011, and 2012. Results are presented in Table 3.4 and confirm results in the main analysis. All the difference-in-difference coefficients are not significant, suggesting that the decrease in leverage is mainly driven by the 2008 reform.

Table 3.4 – Placebo Italy in different years

Dependent Variable	Leverage	Leverage	Leverage	Leverage
	2009	2010	2011	2012
	(1)	(2)	(3)	(4)
Treat x Post Reform	**-0.00106**	**0.00105**	**-0.00124**	**-0.000132**
	(-0.969)	**(1.102)**	**(-1.238)**	**(-0.165)**
Tangibles	-0.112***	-0.0631***	-0.0675***	-0.0679***
	(-28.76)	(-16.70)	(-12.61)	(-15.38)
ROA	-0.245***	-0.274***	-0.272***	-0.289***
	(-30.61)	(-39.63)	(-36.28)	(-44.27)
ROA Vol	-0.0292*	-0.0725***	-0.0535***	0.00922
	(-1.763)	(-5.205)	(-3.417)	(0.700)
Employee	0.00281**	-0.00102	-0.00187	-0.00210**
	(2.181)	(-0.917)	(-1.632)	(-2.368)
Age	-0.00673*	-0.0597***	-0.0624***	-0.0601***
	(-1.712)	(-17.20)	(-15.40)	(-18.38)

Size	0.0375***	0.0711***	0.0711***	0.0675***
	(12.17)	(29.24)	(26.81)	(30.33)
Turnover	0.00394***	0.000804	5.05e-05	-0.000179
	(2.895)	(0.665)	(0.0443)	(-0.192)
Wages	0.00371**	-0.00432***	-0.00452***	-0.00383***
	(2.079)	(-2.951)	(-3.050)	(-3.559)
Current Ratio	-0.0361***	-0.0328***	-0.0313***	-0.0286***
	(-31.37)	(-32.35)	(-29.43)	(-34.86)
NDTS	-0.0678**	-0.123***	-0.110***	-0.0879***
	(-2.227)	(-4.832)	(-4.044)	(-3.908)
Carryforward	0.0172***	0.0182***	0.0176***	0.0163***
	(21.02)	(27.57)	(27.73)	(31.24)
				(0.329)
Constant	0.182***	-0.0490	-0.0374	0.0215
	(4.370)	(-1.298)	(-0.888)	(0.477)
Industry-Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	182,591	183,689	173,242	277,783
R-squared	0.929	0.947	0.949	0.952

This table presents results of placebo tests around different time events. Specifications include Industry-Year fixed effects and firm fixed effects. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles.

To test whether results are not driven by the 2008 financial crisis, I perform a placebo test with French companies. I choose France as I need a country that does not experience a concurrent tax reform and whose economy can be comparable. I replicate my analysis restricting the sample to firms located in France. If the results were affected by other concurrent macro-economic events like the financial crisis, then I argue that firms in Italy and France were likely to be affected in a similar way. Table 3.5 shows results of the placebo test performed

in France around 2008. The difference-in-difference coefficient is not significant across the specifications, confirming our results for Italy.

Table 3.5 – Placebo France

Dependent variable	Leverage	Leverage
	(1)	(2)
Treatment x Post Reform	**0.00509**	**0.000477**
	(1.588)	**(0.181)**
Tangibles		-0.0608***
		(-3.921)
ROA		-0.311***
		(-21.47)
ROA Vol		0.114***
		(3.752)
Employee		-0.00273
		(-0.553)
Age		-0.0895***
		(-6.536)
Size		0.0685***
		(8.737)
Turnover		0.0189***
		(3.242)
Wages		4.64e-06
		(0.000637)
Current Ratio		-0.0690***
		(-17.27)
NDTS		-0.0451
		(-0.521)
Carryforward		0.0244***
		(11.54)

Constant	0.660***	-0.284**
	(75.12)	(-2.261)
Industry-Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	45,131	45,131
R-squared	0.913	0.941

This table presents results of placebo test performed in France around 2008. Specifications include Industry-Year fixed effects and firm fixed effects. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles.

3.6.2 The effect on corporate tax avoidance

The question of whether and how firms balance debt and non-debt tax shields to minimize their tax burden is fundamental in economics, finance, and accounting. This trade-off significantly influences business decisions (e.g., DeAngelo & Masulis, 1980; Graham, 2000; Graham & Leary, 2011). Trade-off models propose that non-debt tax shields, such as accelerated depreciation or tax shelters, can substitute for interest expense, reducing the tax benefits of debt. Research shows firms rely less on debt when engaging in tax sheltering (Graham & Tucker, 2006). Since non-debt tax shields, a form of tax avoidance, can replace debt tax shields like interest deductions, they may lower the marginal benefit of debt financing (De Vito & Jacob, 2023). In line with previous findings (Graham & Tucker, 2006), we find that firms substitute debt tax shield with other forms of tax avoidance strategies, to compensate for the deductibility limit introduced by the reform. Table 3.6 shows regression results where the dependent variable is the effective tax rate (*ETR*) computed as income taxes over pretax income. The coefficient of interest on *Treat x Post Reform* is negative and statistically significant, suggesting that treated firms decrease the effective tax rate and hence increase tax avoidance after the introduction of the interest barrier.

Table 3.6 – The effect on tax avoidance

Dependent variable	ETR	ETR	ETR
	(1)	(2)	(3)
Treatment		0.0334***	
		(8.371)	
Treat x Post Reform	**-0.0320*****	**-0.0225*****	**-0.0303*****
	(-5.655)	(-5.027)	(-5.520)
Leverage		0.193***	0.00589
		(23.34)	(0.261)
Tangibles		0.00470	-0.0112
		(0.783)	(-0.870)
ROA		0.794***	1.042***
		(41.89)	(29.90)
ROA Vol		-1.894***	-1.459***
		(-48.17)	(-22.13)
Employee		-0.00537*	0.00499
		(-1.788)	(0.850)
Age		0.00385*	0.0445*
		(1.900)	(1.954)
Size		-0.0615***	-0.00379
		(-29.67)	(-0.452)
Turnover		0.0165***	0.0127**
		(7.755)	(2.222)
Wages		0.0398***	0.0322***
		(12.40)	(4.234)
Current Ratio		0.000542	0.00429
		(0.404)	(1.539)
NDTS		-0.242***	-0.172
		(-5.241)	(-1.487)

Carryforward		-0.123***	0.0963***
		(-34.47)	(20.38)
Parent_Italy		0.0366***	
		(7.703)	
Constant	0.473***	0.869***	-0.601***
	(141.5)	(25.55)	(-3.908)
Industry-Year FE	Yes	Yes	Yes
Firm FE	Yes	No	Yes
Observations	125,819	125,819	125,819
R-squared	0.509	0.189	0.538

This table presents results of estimating a difference-in-difference specification where GAAP ETR is the dependent variable. Specifications include Industry-Year fixed effects and firm fixed effects. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles.

3.7 Conclusions

Despite existing research on the topic is rather vast, the literature continues to struggle to document a consistent relation between corporate debt policies and taxes. As Hanlon and Heitzman (2022) summarize, coefficient estimates are statistically significant in some settings, but if the models are correct and the coefficients are reliable, they imply economic gains to leverage adjustments that appear too small to overcome even reasonable estimates of transactions costs.

This study focuses on the 2008 Italian Budget Law, which limited the immediate deductibility of interest expenses, to investigate firms' reliance on the debt tax shield. The reform reduces the tax shield's appeal, increasing the relative cost of debt compared to equity. As the tax shield is key to optimizing capital structure, firms are expected to adjust by lowering leverage, shifting from debt to equity financing to counteract the diminished financial incentive for using debt.

One of the key takeaways is the pivotal role of the interest tax shield in shaping firms' financing decisions. The ability to deduct interest expenses from taxable income provides a significant incentive for firms to favor debt over equity. However, the findings demonstrate that this incentive is not absolute; it is moderated by other factors such as financial distress costs, firm-specific characteristics, and the availability of alternative tax-saving mechanisms. The Italian reform, which capped interest deductibility at 30% of adjusted EBITDA, effectively reduced the attractiveness of debt financing by diminishing the value of the debt tax shield. As a result, firms adjusted their capital structures by lowering their leverage ratios, shifting towards equity financing or other non-debt forms of funding.

The chapter also highlights the substitution effect between debt tax shields and non-debt tax shields. Firms with substantial non-debt tax shields, such as accelerated depreciation or tax shelters, are less reliant on debt financing. This substitution effect was particularly evident in the wake of the Italian reform, as firms sought to compensate for the reduced benefits of debt by increasing their engagement in tax avoidance strategies. This shift underscores the adaptability of firms in navigating tax policy changes, as well as the unintended consequences of such reforms. While the reform aimed to reduce reliance on debt and align Italy's tax system with international standards, it also incentivized firms to pursue more aggressive tax planning strategies, potentially undermining the broader goals of tax policy.

Another important contribution of this analysis is its exploration of unresolved puzzles in the capital structure literature, such as the debt conservatism puzzle and the inverse relationship between profitability and leverage. The findings suggest that these puzzles may be partly explained by the interplay between tax policy and firm-specific factors. For instance, profitable firms may exhibit lower leverage not because they lack the incentive to utilize the interest tax shield, but because they have access to alternative tax-saving mechanisms that reduce the marginal benefit of debt.

From a policy perspective, the chapter underscores the importance of designing tax reforms that balance competing objectives. While the

Italian thin capitalization rule successfully reduced leverage and addressed concerns about excessive reliance on debt, it also highlighted the potential for unintended consequences, such as increased tax avoidance. Policymakers must consider these trade-offs and adopt a holistic approach that accounts for the interconnectedness of tax policy, corporate finance, and economic behavior.

In conclusion, this chapter provides valuable insights into the determinants and implications of capital structure decisions, emphasizing the role of taxes and tax incentives. By examining the Italian reform as a case study, it highlights the nuanced ways in which firms respond to changes in tax policy, offering lessons for both researchers and policymakers. Future research could build on these findings by exploring the long-term effects of tax reforms on corporate behavior and economic outcomes, as well as the broader implications for global tax policy in an increasingly interconnected world.

Chapter 4 CEO and CFO inside debt and corporate tax risk: The role of corporate governance

4.1 Overview

This chapter delves into the intricate relationship between executives' inside debt holdings and corporate tax risk, emphasizing the role of corporate governance in shaping these dynamics. Inside debt, comprising pension plans and deferred compensation, represents a unique component of executive compensation that aligns the interests of executives with those of external debtholders. Unlike equity-based compensation, which often incentivizes risk-taking to maximize shareholder returns, inside debt is unsecured and unfunded, exposing executives to the same risks faced by creditors. This alignment encourages a more conservative managerial approach, particularly concerning financial and tax-related decisions. Consequently, the chapter hypothesizes that inside debt holdings can mitigate the risk associated with aggressive tax avoidance activities.

Tax avoidance, while potentially beneficial in reducing a firm's tax liabilities and increasing after-tax cash flows, carries inherent risks. These include regulatory scrutiny, reputational damage, and uncertainty regarding future tax liabilities. Firms engaging in aggressive tax strategies may face challenges in sustaining these positions over time, leading to fluctuations in future cash flows. This uncertainty, referred to as tax risk, is a critical aspect of corporate decision-making that influences firm value and stability. By examining the relationship

between inside debt and tax risk, this chapter sheds light on how exec-
utive compensation structures can influence corporate tax strategies.

The findings presented in this chapter reveal a negative relationship
between executives' inside debt holdings and tax risk, supporting the
hypothesis that inside debt incentivizes conservative behavior. This
relationship is particularly pronounced in firms with higher levels of
tax risk, where the uncertainty surrounding future tax positions is
more significant. The chapter further explores how this relationship
varies across different corporate contexts, including firms with vary-
ing levels of liquidity constraints and corporate governance strength.

One of the key insights is that the mitigating effect of inside debt on
tax risk is stronger in firms that are not facing liquidity constraints.
In these firms, the availability of surplus cash reduces the pressure on
managers to engage in aggressive tax planning to generate immediate
cash flow benefits. Instead, managers with significant inside debt hold-
ings prioritize long-term stability over short-term gains, leading to a
reduction in tax risk. Conversely, in firms with liquidity constraints,
the need for immediate cash flow may override the conservative in-
centives provided by inside debt, weakening its impact on tax risk.

Corporate governance also plays a pivotal role in moderating the
relationship between inside debt and tax risk. The chapter highlights
that the strength of governance mechanisms, such as institutional
ownership, can influence the effectiveness of inside debt in curbing
tax risk. In well-governed firms, institutional ownership serves as a
substitute for inside debt, providing an additional layer of oversight
and reducing the need for inside debt to act as a risk-mitigating mech-
anism. This substitution effect underscores the interplay between dif-
ferent governance tools in shaping corporate behavior.

Overall, this chapter contributes to the broader literature on exec-
utive compensation, corporate governance, and tax planning by pro-
viding empirical evidence on the role of inside debt in influencing tax
risk. It addresses gaps in the existing research by focusing on the risk
dimension of tax avoidance rather than the level of tax payments. By
doing so, it offers a nuanced understanding of how compensation
structures can align managerial incentives with the interests of both

shareholders and debtholders, promoting more balanced and sustainable corporate strategies.

The findings have significant implications for policymakers and practitioners. For policymakers, understanding the impact of executive compensation on tax risk can inform the design of regulations aimed at promoting corporate transparency and stability. For practitioners, the insights highlight the importance of considering the risk implications of tax strategies and the role of executive compensation in shaping managerial behavior. By aligning executive incentives with long-term stability, firms can achieve a more balanced approach to tax planning that minimizes risk while maximizing value.

4.2 Introduction

In contrast to the international debate on tax base erosion, profit shifting, and the public perception of overly aggressive corporate tax avoidance, empirical evidence suggests that not all firms fully exploit the available tax avoidance opportunities. The extent of aggressive tax planning varies, even after accounting for firm-specific factors such as profitability, foreign operations, R&D expenditures, leverage, and earnings quality (Rego, 2003; Graham & Tucker, 2006; Frank et al., 2009; Wilson, 2009; Dyreng et al., 2010). The intriguing observation that some firms do not take full advantage of all tax avoidance strategies—referred to as the "tax undersheltering puzzle"—remains poorly understood despite significant research efforts (Weisbach, 2002; Desai & Dharmapala, 2006; Hanlon & Heitzman, 2010).

Corporate governance plays a critical role in shaping managerial behavior and ensuring that executives act in the best interest of shareholders. A well-structured corporate governance framework establishes mechanisms to monitor and incentivize managers, aligning their actions with the goal of maximizing firm value. One key element of corporate governance is executive compensation, which serves as a tool to influence managerial decision-making. By linking executive pay to firm performance through high-powered incentives, such as stock options or performance-based bonuses, firms aim to reduce

agency problems and encourage managers to prioritize shareholder wealth.

However, the relationship between executive compensation and managerial behavior is complex and can lead to unintended consequences. For instance, high-powered incentives may motivate managers to engage in opportunistic behaviors, such as earnings manipulation, excessive risk-taking, or aggressive tax avoidance strategies. While tax avoidance can enhance firm value by reducing tax liabilities, it also carries risks, including reputational damage, regulatory scrutiny, and potential misalignment with long-term shareholder interests.

Previous studies on tax avoidance have investigated the role of corporate governance and executive compensation (Phillips, 2003; Desai &Dharmapala, 2006; Hanlon et al., 2007; Armstrong et al., 2012; Rego &Wilson, 2012); however, the results are mixed. For example, Gaertner (2014) finds a negative relation between CEO after-tax incentives and effective tax rates (ETRs). This contrasts with the results of Phillips (2003), who provides evidence for business unit managers rather than CEOs. Armstrong et al. (2012) show a positive association only between the compensation of tax directors and ETRs, while Rego and Wilson (2012) find that greater CEO and chief financial officer (CFO) equity risk compensation is associated with more tax avoidance. However, their results do not vary with corporate governance strength.

In this study, we examine corporate governance, particularly executive inside debt holdings, as a possible source of the heterogeneity in corporate tax avoidance across firms. Specifically, we examine how inside debt is related to tax risk. We show that part of the relationship between executive compensation and tax avoidance is related to tax risk.

In addition to cash and equity compensation, inside debt (*i.e.*, pension plans and deferred compensation) constitute an important fraction of executive compensation. The average CEO inside debt compensation consists of around $4.6 million and represents 11% of overall executive compensation. Since this component of the executive compensation package is mostly unsecured and unfunded, agency theory predicts that managers should act more conservatively toward risk (Jensen &

Meckling, 1976). Consistent with the argument that inside debt holdings provide managers with incentives to act more conservatively toward risk, previous studies show that inside debt holdings are negatively associated with a comprehensive set of measures that capture investor reactions and the overall riskiness of a firm's investment and financial policies (Edmans & Liu, 2010; Wei & Yermack, 2011; Cassell et al., 2012).

Since a firm's tax policy is set at the top management level (Dyreng et al., 2010), we would expect that firms with high levels of inside debt also act more conservatively concerning taxes. While more aggressive or riskier tax avoidance lowers the tax burden and increases current after-tax cash flows, such risky tax avoidance comes with several costs. Aggressive tax positions might not be sustainable in the future and lead to uncertainty about future tax positions. The increase in tax risk contributes to the uncertainty of future after-tax cash flows, even if uncertainty about pre-tax cash flows is held constant.

Previous studies suggest that the association between tax avoidance and firm value could depend upon the degree of risk involved in the tax strategy implemented (Desai & Dharmapala, 2009; Hutchens & Rego, 2015; Drake et al., 2019). As mentioned, Jensen and Meckling (1976) predict that inside debt compensation should mitigate risk-shifting. We argue that the level of corporate tax avoidance does not represent the actual risk embedded in the tax positions (Guenther et al., 2016) and, therefore, analyze the risk associated with tax planning and its relation to inside debt holdings. Moreover, adding to previous research (Kubick et al., 2020; Chi et al., 2017) that examines whether inside debt held by executives is associated with the level of tax avoidance and tax sheltering, we analyze the risk associated with tax planning and its relation to inside debt holdings.

In our empirical research design, we measure tax risk with unrecognized tax benefits (UTBs), defined in FIN 48, which capture executives' assessments of the riskiness of a firm's tax planning strategies. Our main sample consists of 2,876 CEO–year observations and 2,710 CFO–year observations with complete compensation and financial data from 2006 through 2012. The data on inside debt holdings are available

from ExecuComp since 2006, when the U.S. Securities and Exchange Commission (SEC) disclosure reform increased the transparency of inside debt, pensions and deferred compensation. We measure inside debt holdings as the ratio of the present value of accumulated pension plans and deferred compensation to total compensation (*i.e.*, the sum of salary, bonus, stock and option compensation, and inside debt).

Our research design faces the major challenge that managerial incentives are set through executive compensation, and firm policies are likely to be jointly determined, particularly when examining tax planning (Coles et al., 2006; Rego & Wilson, 2012). Tax concerns are likely to be a determinant of how the executive compensation contract is structured. Hence, establishing causality in this framework is highly difficult. Therefore, following both Cassell et al. (2012) and Rego and Wilson (2012), we use a simultaneous equation approach as well as a lagged specification with compensation variables set the previous year. In all our tests, we control for the level of equity-based incentives as well as for other firm-level proxies of corporate tax avoidance.

Our results are consistent with the expectation that inside debt aligns managers' risk incentives with debtholders' risk preferences. We observe lower tax risk in firms with higher inside debt compensation managers. This relation is not only statistically but also economically significant. A one standard deviation increase in inside debt holdings over total compensation is associated with a 20% decrease in UTBs. In a second step, we examine whether this relation is stronger at higher levels of tax risk. We argue that, at higher levels of tax risk, the uncertainty about future tax payoffs is higher, and thus, the alignment of managers' and debtholders' interests through inside debt could be more effective. Thus, since inside debt aligns executives' and debtholders' interests, we expect a stronger association between inside debt and tax risk when the riskiness of the tax positions is greater. Using a quantile regression approach, we find a concave relation between inside debt holdings and tax risk; the coefficient estimates become increasingly negative for higher quantiles of tax risk.

Next, we turn to two cross-sectional tests. Finding the association between inside debt and tax risk to be stronger when expected also

sheds light on a potential causal link between the two. In the first cross-sectional analysis, we examine differences in the need for internal cash. In firms with low cash availability, managers and debtholders may prefer a short-term cash increase from tax planning to a potential increase in future tax uncertainty. Therefore, we expect that debtholders of firms with liquidity constraints favor tax planning strategies that decrease the tax burden and increase cash flow.

In contrast, we expect a negative association between inside debt and tax risk in firms without liquidity constraints, where the tax risk argument should still dominate. To this end, we interact our proxy for inside debt with a measure of high cash surplus. We find the tax risk-reducing role of inside debt compensation stronger when liquidity constraints do not bind firms. In firms with high levels of surplus cash, the relation between inside debt and tax risk increases by over 200% relative to all other firms.

Our second cross-sectional test analyzes whether the relation between inside debt holdings and tax risk varies with the strength of corporate governance. We use the level of institutional shareholdings as a proxy for corporate governance (McConnell & Servaes, 1990; Fernando et al., 2012). Monitoring institutional owners is a substitute for inside debt in reducing tax risk. Namely, inside debt compensation is no longer associated with decreased tax risk in firms with strong corporate governance. The association of tax risk and inside debt is significant only for firms not in the top quartile of institutional shareholdings.

We subject our results to an extensive set of robustness tests. First, we look at CEO and CFO compensation since corporate tax departments are viewed as profit centers (Crocker & Slemrod, 2005; Robinson et al., 2010). The results are consistently similar for the two executives. Our results also hold when examining the level of tax avoidance through cash ETRs and when using an alternative measure of inside debt. Generally, firms with a high level of executive inside debt appear to reduce their tax risk at the cost of the foregone short-term benefits of tax avoidance.

We contribute to the tax literature on the determinants of tax avoidance (e.g., Rego, 2003; Dyreng et al., 2008, 2010, or the literature overview of Hanlon & Heitzman, 2010). We complement prior studies that limit the analysis to the link between equity risk incentives and tax-aggressive strategies (e.g., Rego & Wilson, 2012) by examining the link between inside debt and tax risk. Instead of reducing their tax burden through aggressive tax planning, firms with higher inside debt holdings appear to be more concerned about tax risk and thus reduce the riskiness of their tax positions. Previous studies on inside debt and tax avoidance find either mixed results depending on the executive (Kubick et al., 2020) or focus on tax sheltering (Chi et al., 2017), which stands at the end of the continuum of tax planning strategies (Lisowsky et al., 2013). Conceptually, corporate tax strategies can be considered as a continuum, from tax avoidance to tax aggressiveness to tax sheltering (Hanlon & Heitzman (2010), which stands as the most aggressive form of tax strategies.

We also contribute to the discussion on the role of corporate governance. Previous research has found generally mixed results (Desai & Dharmapala, 2006; Rego & Wilson, 2012) when examining how the strength of corporate governance affects the relationship between tax avoidance and compensation incentives.

Our results on a potential determinant of tax risk also have broader implications for firm decisions. Recent research highlights how tax uncertainty adversely affects the level and timing of investments (Blouin et al., 2012; Jacob et al., 2022), firms' cash holdings for precautionary reasons (Hanlon et al., 2017), earnings persistence (Hanlon, 2005; Blaylock et al., 2012), and firm valuation (Hutchens & Rego, 2015). On a broader macroeconomic level, tax risk and the resulting variation of firms' tax payments could translate into more volatile and less predictable government tax revenues, a concern for several countries that try to reduce the volatility of tax revenues by setting specific tax accounting rules (Goncharov & Jacob, 2014).

4.3 Theoretical background and hypothesis development

According to Jensen and Meckling (1976), incentives are needed to mitigate the shareholder–manager conflict and to reduce the risk-shifting problem. Therefore, the authors suggest that firms need an incentive structure under which the manager's personal holdings of the firm's debt and equity should mimic the firm's overall external capital structure. Consequently, managers should be granted equity-based and debt compensation, namely, inside debt. While a large body of research studies the use of pay-for-performance and equity incentives in aligning managers' interests with those of shareholders (Guay, 1999; Rajgopal & Shevlin, 2002; Coles et al., 2006; Rego & Wilson, 2012), Edmans and Liu (2010) argue that inside debt (*i.e.*, pension benefits and deferred compensation) is a superior solution to the risk-shifting problem than cash compensation is because it exposes managers to the same default risk as outside creditors. Because the inside debt obligations of the top management team are unsecured, unfunded, and payable at a future date, they are characterized by an asymmetric payoff function concerning the firm's net assets (Watts, 2003). Therefore, the value of inside debt holdings is sensitive to both the probability of bankruptcy and the firm's liquidation value in the event of bankruptcy or reorganization (Edmans & Liu, 2010).

Due to limited reporting requirements, empirical research on inside debt compensation was rather scant until an SEC disclosure reform in 2006 greatly increased the transparency of pensions and deferred compensation. Although tax research has examined the connection between cash-based and equity compensation and tax avoidance (Phillips, 2003; Desai & Dharmapala, 2006; Rego & Wilson, 2012), the evidence on the effect of inside debt compensation on tax avoidance is still mixed (Kubick et al., 2020; Chi et al., 2017). Following prior studies that show a negative association between CEO inside debt holdings and the riskiness of firm investment, financial policies, and future stock returns (e.g., Edmans & Liu, 2011; Wei & Yermack, 2011; Cassell et al., 2012), we argue that inside debt compensation is a plausible determinant of tax avoidance. From the shareholders' perspective, tax avoidance can be viewed as value increasing since it reduces

tax liabilities and, thus, increases after-tax cash flows (Rego & Wilson, 2012). Similarly, for debtholders, tax avoidance has positive effects: In the short run, tax planning could reduce current tax payments and, thereby, increase a firm's liquidity. Assuming that tax-induced liquidity translates into lower default probability, debtholders might prefer greater tax avoidance. Since inside debt holdings align with the interests of managers and debtholders, greater inside debt could be associated with more aggressive tax avoidance.

However, a tax benefit today might not be sustainable and could be reversed in the future. In other words, today's aggressive tax planning could negatively impact future tax outcomes (e.g., Dyreng et al., 2008). The increased variance of the payoffs from tax avoidance strategies translates into the lower predictability of future tax outflows, even for constant pre-tax cash flows (e.g., Guenther et al., 2016). From the debtholders' perspective, uncertainty about future tax outcomes is valued negatively since overall firm risk comprises not only operational or financial risk but also tax risk. If managers with high inside debt holdings act more conservatively, that is, if their preferences are more aligned with those of debtholders, we expect executives with high inside debt holdings to lower tax risk. We thus formulate our first hypothesis as follows.

H1: Executive inside debt holdings are negatively associated with corporate tax risk.

We also argue that the risk-shifting problem is more severe at higher levels of risk. If inside debt does mitigate the agency cost of debt, we expect this mechanism to be more effective for greater risk (*i.e.*, tax risk). Put differently, do inside debt holdings relate to tax risk differently for firms with high tax risk than for those with average tax risk? At higher levels of tax risk, the uncertainty about future tax payoffs is higher. In this scenario, the bondholders' and managers' interests are aligned against taking additional risky tax positions that could reverse in the future. Thus, since inside debt aligns executives' and debtholders' interests, we expect a stronger association when inside debt is more in demand. On the other hand, at low levels of tax risk, when the firm does not expect its tax positions to be challenged and

eventually reversed, inside debt might not matter for tax risk. As a result, we formulate our second hypothesis as follows.

> H2: The negative association between executives' inside debt holdings and tax risk is stronger at higher levels of tax risk.

A notable source of cross-sectional variation that we examine is the strength of corporate governance. Previous studies on tax avoidance have investigated the interaction between corporate governance measures and compensation incentives. However, the findings are mixed. Desai and Dharmapala (2006) argue that managerial rent extraction is higher in firms with weak governance. Thus, aligning managers' and shareholders' interests through equity incentives should result in lower rent extraction and tax avoidance. The authors interpret this result as a complementary relation between tax avoidance and diversion.

In contrast, Rego and Wilson (2012) examine whether other governance mechanisms affect the relation between tax avoidance and equity risk compensation but do not find significant results. Armstrong et al. (2015) argue that the impact of corporate governance on tax avoidance is stronger at the lower and upper tails of the tax avoidance distribution. Complementing this research, we examine whether the relation between inside debt holdings and tax varies with governance strength. If inside debt holdings moderate tax risk, we assume they do so in the same direction as strong monitoring. Hence, the resulting association between inside debt and tax risk could be strengthened in those firms with strong corporate governance. In this case, inside debt and strong governance would be complements.

On the other hand, inside debt compensation might not be necessary for moderating tax risk in strong governance environments since other mechanisms are already in place to mitigate executives' risky strategies. In such environments, institutional ownership could be a monitoring mechanism beyond inside debt compensation; both become substitutes. Since we lean toward the substitution argument, we state our fourth hypothesis as follows.

> H3: The negative association between executives inside debt holdings and tax risk is weaker in strong corporate governance environments.

4.4 Variable measurement and empirical research design

4.4.1 Tax risk measurement

To test our hypotheses, we need a proxy of tax risk. Tax risk cannot be captured by the level of tax avoidance measured by ETRs. If a firm's tax planning strategies result in a low ETR that is sustainable in the long run, ETR-based measures would capture the level of the tax avoidance pursued by the corporation but not its tax uncertainty (Guenther et al., 2016). Moreover, we want to examine how a portion of executive compensation is associated with what managers perceive as tax risk, that is, tax positions that may or may not reverse in the future and result in tax payments. To this end, we use UTBs mandated by FIN 48 (now ASC 740-10-25), because they represent a measure of managers' assessment of firm tax risk. UTBs are contingent liabilities that represent the dollar amount of estimated tax benefits that the firm expects will not be recognized by tax authorities in the future. This measure has been used by previous studies in relation to tax uncertainty (Lisowsky, 2010; Blouin et al., 2012; Rego & Wilson, 2012; Beck & Lisowsky, 2013; Lisowsky et al., 2013; Hanlon et al., 2017; Ciconte et al., 2024) to investigate the riskier end of tax avoidance continuum outcomes and tax sheltering.

Another advantage of using UTBs is that this measure is subject to a truncation bias, as ETRs measures are, because loss years are included in the analysis and there are no problems in interpreting negative denominators, as with ETR-based proxies of tax uncertainty. However, this measure presents some limitations, since UTBs are associated with a certain degree of discretion. FIN 48 requires a two-step procedure according to which tax positions undergo a "more likely than not" recognition test. Nevertheless, there is evidence (Ciconte et al., 2024) of UTBs being an unbiased measure of the potential for future tax cash outflows, since it appears that there is no systematic under- or overstatement of tax uncertainty. Moreover, since we are interested in managers' assessment of risky tax positions, we confidently choose UTBs as our main variable to capture tax risk.

4.4.2 Inside debt variables

Since corporate tax departments are viewed as profit centers (Crocker & Slemrod, 2005; Robinson et al., 2010), we expect both the CEO and CFO to have a high level of sophistication and thus a strong impact on the firm's tax planning strategy and tax avoidance activities. We therefore limit our analysis to the inside debt compensation held by these two executives. This approach is also consistent with the observation that tax avoidance strategies are set at the top executive level (Dyreng et al., 2010).

Our measure of CEO and CFO inside debt is thus the sum of the present value of accumulated deferred compensation and pension plans scaled by total compensation. Total compensation includes salary, bonus, the value of stock and option compensation, and inside debt holdings. We choose this proxy because it takes into account all the different components of the compensation package. We are interested in examining inside debt incentives in combination with risk and performance-based incentives. We calculate stock value by multiplying the number of shares owned by the stock price at the firm's fiscal year-end. The value of options is computed applying the Black–Scholes (1973) option model (Core & Guay 1999, 2002). Our results are not sensitive to this research design choice.

4.4.3 Empirical research design

Managerial incentives set through executive compensation and firm policies are likely to be jointly determined (Coles et al., 2006; Rego & Wilson, 2012). Tax concerns are likely to be a determinant of how the executive compensation contract is structured. Therefore, establishing causality in this framework is very difficult. OLS estimates will be biased if the independent variables are endogenously determined together with the dependent variable. To deal with this issue, the previous literature uses different approaches. Coles et al. (2006) address the issue by using lagged specifications with lagged (equity) compensation variables, fixed effects, and predicted values of compensation variables as instruments. They also use simultaneous equations mod-

els to isolate the effect of incentives on firm investment and financial policy and vice versa. Nevertheless, to implement the model through two-stage least squares estimation, one needs at least one exogenous variable per equation. The problem arises because all of the observable variables potentially affect both the executive compensation and the firm's policies.

In our setting, instrumental variables are not easy to find due to the difficulties in finding exogenous variations in the contracting variable, which is likely to be uncorrelated with tax implications. Rego and Wilson (2012) recognize that it is challenging to identify firm characteristics that are significantly associated with tax avoidance but not with risk taking incentives. Nevertheless, for our simultaneous equation model and in line with Rego and Wilson (2012), we select *NOL* (the change in tax loss carryforward) as the exogenous variable when estimating tax avoidance outcomes and *AGE* as the exogenous variable when estimating inside debt holdings. We expect these variables to be uncorrelated with the other endogenous variables in our system of equations. Untabulated correlation analyses show that NOL is correlated with the tax avoidance variables but not with *INSIDE DEBT*. Similarly, AGE is correlated with the inside debt holdings variables but not with tax risk. This assumption is consistent with the findings of Dyreng et al. (2010). While the tone is set "at the top," that is, CEOs and CFOs drive tax avoidance decisions, individual CEO and CFO characteristics, such as age and tenure, do not explain the executives' effect on corporate tax avoidance.

Based on this discussion, we test H1 by adapting the model of Rego and Wilson (2012) for equity risk incentives. We implement the following simultaneous system of equations, where *TAX RISK* and *INSIDE DEBT* are the endogenous dependent variables. We use UTBs (*UTB*) as a measure of tax risk. We use the ratio of inside debt compensation to total compensation to measure *INSIDE DEBT*. We estimate the parameters for our system of equations using two-stage least squares, as follows:

$$Tax\ risk_t = \beta_0 + \beta_1 Inside\ Debt_{i,t} + \beta_2 Delta_{i,t} + \beta_3 Vega_{i,t} + \beta_4 \Sigma Controls_{i,t} + \beta_5 Industry\ FE_{i,t}$$
$$+ \beta_6 Firm\ FE_{i,t}$$
$$+ \varepsilon \qquad\qquad\qquad (Eq.\ 1)$$

$$Inside\ Debt_{i,t} = \gamma_0 + \gamma_1 Tax\ risk_t + \gamma_2 Delta_{i,t} + \gamma_3 Vega_{i,t} + \gamma_4 \Sigma Controls_{i,t} + \beta_5 Industry\ FE_{i,t}$$
$$+ \beta_6 Firm\ FE_{i,t}$$
$$+ \varepsilon \qquad\qquad\qquad (Eq.\ 2)$$

In line with H1, we expect to be negative, since inside debt holdings motivate managers to act more conservatively and therefore take less risky tax positions. Following prior literature on executive compensation (e.g., Cassell et al., 2012), we control for equity risk incentives. The variable *DELTA* is computed as 1% × (share price) × (number of stocks held) + 1% × (option delta) × (number of options held) and *VEGA* is the sensitivity of the change in the Black−Scholes option value for a 1% change in stock option volatility, multiplied by the number of options granted to the CEO. In our regressions, we use the natural logarithm of delta and vega.

According to Rego and Wilson's (2012) model, equation (1) also controls for the natural log of total assets (*SIZE*), pre-tax returns on assets (ROA, *Pre Tax ROA*), an indicator variable for net operating loss carryforwards (*NOL*), the change in net operating loss carryforwards (*NOL*), foreign pre-tax income (*FOREIGN*), leverage (*LEVERAGE*), intangibles (*INTANGIBLES*), *R&D*, capital expenditures (*CAPX*), discretionary accruals (*DA*), and the standard deviation of pre-tax ROAs ((ROA)). In equation (2), we also include executive characteristics, such as *AGE* and *TENURE*, a dummy variable that indicates a change in CEO (*TURNOVER*), a dummy variable denoting whether the CEO is also the chairperson of the board (*CHAIRMAN*), and other firm-level control variables, such as *SIZE*, growth opportunities (*MtB*), an indicator variable for a loss in the given year (*LOSS*), and stock return volatility ((RET)). Moreover, we include liquidity constraints measures such as free cash flow (*FCF*), cash flow volatility ((CF)) in equation (1) and *SURPLUS CASH* in equation (2), since we expect constrained firms to react differently from unconstrained ones. All the variables are described in Appendix 4.A. We also include industry and year fixed effects in both equations.

Our second hypothesis argues that there might be a stronger negative relation between inside debt and tax risk at higher levels of tax risk. To test this idea, we build on the lagged specification model based on equation (1) and estimate the following specification using quantile regressions:

$$Tax\ risk_t = \beta_0 + \beta_1^q High\ Inside\ Debt_{i,t-1} + \beta_2 Delta_{i,t-1} + \beta_3 Vega_{i,t-1} + \beta_4 \Sigma Controls_t$$
$$+ \beta_5 Industry\ FE_{i,t} + \beta_6 Firm\ FE_{i,t} + \varepsilon \qquad (Eq.\ 3)$$

where *High INSIDE DEBT* is an indicator variable equal to one when the executive's inside debt holdings are above the median. We use lagged compensation variables and include all the control variables from equation (1). If the relation between inside debt holdings and tax risk is similar across all quantiles of tax risk, we would observe to be the same through all the quantiles and a flat distribution of coefficients across the different levels (quantiles) of tax risk. On the other hand, we argue that the association is non-linear and inside debt is more strongly associated with tax risk at higher levels of tax risk. Therefore, we expect to become more negative at higher quantiles of tax risk.

In the final step, we examine the cross-sectional prediction from H3 and H4. Hypotheses H3 and H4 argue that cash availability and strong corporate governance have an impact on the association between inside debt holdings and tax risk. To test this, we build on the lagged specification model including industry and year fixed effects.[9] We thus estimate the following equations (4) and (5):

$$Tax\ risk_t = \mu_0 + \mu_1 High\ Inside\ Debt_{i,t-1} + \mu_2 Surplus\ Cash_{i,t-1}$$
$$+ \mu_3 High\ Inside\ Debt_{i,t-1} \times Surplus\ Cash_{i,t-1} + \beta\mu_4 \Sigma Controls_t + \mu_5 Industry\ FE_{i,t}$$
$$+ \mu_6 Year_{i,t}$$
$$+ \varepsilon \qquad \left(Eq.\ 4\right)$$

$$Tax\ risk_t = \lambda_0 + \lambda_1 High\ Inside\ Debt_{i,t-1} + \lambda_2 Institutional\ Holdings_{i,t}$$
$$+ \lambda_3 High\ Inside\ Debt_{i,t-1} \times Institutional\ Holdings_{i,t} + \lambda_4 \Sigma Controls_t$$
$$+ \lambda Industry\ FE_{i,t} + \lambda Year\ FE_{i,t} + \varepsilon \qquad \left(Eq.\ 5\right)$$

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[9] We do not include firm fixed effects mainly because of the short time horizon in our analysis. The UTB data are only available since 2006 and we are left with a limited number of observations.

where *High INSIDE DEBT* is a dummy variable equal to one when inside debt is above the median (75th percentile). In equation (4), we also include the dummy variable *High SURPLUS CASH,* which is equal to one when surplus cash is above the 75th percentile. Our variable of interest is the interaction term between *High INSIDE DEBT* and *High SURPLUS CASH.* We expect μ_3 to be negative, since high inside debt holdings should provide executives with incentives to decrease tax risk in the absence of liquidity constraints. Moreover, we expect μ_1 to be negative consistent with equation (1) and H1. The association between cash availability and tax risk (μ_2) is rather unclear. On the one hand, cash-constrained firms could increase the riskiness of their tax positions to decrease their tax burdens and free liquidity ($\mu_2 > 0$). On the other hand, Kubick et al. (2015) argue that cash availability and the predictability of future cash flows provide firms with additional ability to engage in tax planning ($\mu_2 < 0$). Following these arguments, we do not make any clear prediction regarding the sign of l_2.

In equation (5), we test H4 and additionally include *High INSTITU-TIONAL HOLD,* which is a dummy variable equal to one when a firm's institutional ownership share is above the 75th percentile. Since institutional ownership acts as a monitoring mechanism of the firm's strategic decisions, we expect tax risk to be lower when institutional ownership is high ($\lambda_2 < 0$). Our variable of interest is the interaction term *High INSIDE DEBT × High INSTITUTIONAL HOLD.* In a strong corporate governance environment where agency problems are not exacerbated, management and ownership's interests are well aligned. In this context, the role of inside debt holdings in constraining executives' risk-taking behaviors could be substituted by the monitoring function of institutional ownership. Consequently, we expect λ_3 to be positive. That is, the negative association between inside debt holdings and tax risk is weaker in firms with strong governance.

4.5 Data and summary statistics

We use ExecuComp and Compustat data over the period 2007–2012. Our sample starts in 2007, since FIN 48 became effective starting in

2007. Consistent with prior tax avoidance studies, we eliminate financial institutions (SIC from 6000–6999) and utility firms (SIC codes 4900–4999). We construct the sample by first requiring non-missing CEO debt and equity compensation data from the Compustat Execu-Comp database. We also drop all firm–year observations missing data required to compute the tax avoidance and control variables used in our analysis. The final sample for our variables of interest (*UTB*) consists of 2,876 CEO–firm–year and 2,710 CFO–firm–year observations. We winsorize all continuous variables at the first and 99th percentiles. Table 4.1 reports the sample composition by time (Panel A) and two-digit SIC code (Panel B).

Table 4.1 - Time and industry distribution

Panel A: Time distribution				
Fiscal year	Frequency	%	Cumulative Freq.	Cumulative %
2007	365	12.69	365	12.69
2008	404	14.05	769	26.74
2009	531	18.46	1,300	45.20
2010	597	20.76	1,897	65.96
2011	543	18.88	2,440	84.84
2012	436	15.16	2,876	100.00
Panel B: Industry distribution				
Industry (1-digit SIC)	Frequency	%	Cumulative Freq.	Cumulative %
0, 1 (agriculture, mining, oil, and construction)	114	3.96	114	3.96
2 (food, tobacco, textiles, paper, and chemicals)	558	19.40	672	23.37
3 (manufacturing, machinery, and electronics)	1,134	39.43	1,806	62.80
4 (transportation and communication)	144	5.01	1,950	67.80

5 (wholesale and retail)	361	12.55	2,311	80.35
7 (services)	407	14.15	2,718	94.51
8, 9 (health, legal, and educational services and other)	158	5.49	2,876	100.00

This table reports the sample composition by time (Panel A) and two-digit SIC code (Panel B).

Table 4.2 presents descriptive statistics for tax avoidance measures (Panel A) and the inside debt holdings and equity compensation of CEOs (Panel B) and CFOs (Panel C), as well as for the control variables (Panel D). The mean (median) *UTB* value is 0.01 (0.01). This means that, on average, unrecognized tax benefits represents 1% of total assets at the beginning of the year. The variable *Cash ETR* is defined as cash taxes paid over pre-tax income (TXPD/(PI - SPI)). We examine a one-year proxy to capture short-term tax avoidance, where observations with negative PI - SPI values are excluded from the analysis. Moreover, consistent with the timing of the compensation design and contract negotiation, we measure *Cash ETR* as a three-year rate from year t to $t + 2$ to capture longer-term tax avoidance (Dyreng et al., 2008). We use a three-year window because inside debt data are not available prior to 2006. The mean (median) *Cash ETR* value is 0.26 (0.24). The average long-term ETR, *Cash ETR3*, averages 0.26 (0.25).

With respect to the CEO variables, the average (median) *CEO Inside Debt* is $4,557,000 ($597,000). The average (median) *CEO Inside Debt Ratio* is 0.11 (0.03). These findings already indicate that pension plans and deferred compensation add up to a noteworthy amount of the executive compensation package. The mean (median) *Vega* is 4.29 (4.43). The average *CFO Inside Debt* is smaller than *CEO Inside Debt* and amounts to $1,040,000, with a median of $109,000. The mean (median) CFO *Inside Debt Ratio* is 0.10 (0.03).

Table 4.2 – Descriptive statistics

Variable	N	Mean	S.D.	Q1	Median	Q3
Panel A: Tax avoidance proxies						
UTB	2876	0.01	0.02	0.00	0.01	0.02
Cash ETR	3552	0.26	0.19	0.13	0.24	0.34
Cash ETR3	2317	0.26	0.17	0.16	0.25	0.33
Panel B: CEO characteristics						
CEO Inside Debt ($thousands)	2876	4557	9669	0.00	597	4624
CEO Inside Debt Ratio	2876	0.11	0.15	0.00	0.03	0.17
CEO High ID	2876	0.54	0.50	0.00	1.00	1.00
CEO Log Inside Debt	1842	7.74	1.75	6.57	7.97	9.07
CEO Delta	2876	5.42	1.30	4.58	5.42	6.32
CEO Vega	2876	4.29	1.58	3.33	4.43	5.40
CEO Age	2876	54.90	6.61	50.00	55.00	60.00
CEO Tenure	2876	7.33	5.99	3.04	5.84	9.67
CEO Turnover	2876	0.10	0.29	0.00	0.00	0.00
CEO Chairman	2876	0.51	0.50	0.00	1.00	1.00
Panel C: CFO characteristics						
CFO Inside Debt ($thousands)	2710	1040	2216	0.00	109	886
CFO Inside Debt Ratio	2710	0.10	0.15	0.00	0.03	0.14
CFO High ID	2710	0.54	0.50	0.00	1.00	1.00
CFO Delta	2710	3.82	1.21	3.08	3.87	4.65
CFO Vega	2710	2.99	1.45	2.11	3.11	4.02
CFO Age	2710	50.48	6.30	46.00	50.00	55.00
Panel D: Firm controls						
MtB	2876	2.83	2.61	1.39	2.10	3.24
Size	2876	7.53	1.46	6.48	7.45	8.47

Leverage	2876	0.22	0.19	0.04	0.19	0.32
Foreign	2876	0.03	0.05	0.00	0.01	0.05
(Ret)	2876	0.42	0.16	0.30	0.40	0.50
Pre-tax ROA	2876	0.08	0.12	0.03	0.09	0.14
(ROA)	2876	0.06	0.06	0.02	0.04	0.07
NOL	2876	0.82	0.38	1.00	1.00	1.00
NOL	2876	0.01	0.08	-0.00	0.00	0.01
Discr. Acc.	2876	0.05	0.05	0.02	0.03	0.06
Capx	2876	0.05	0.06	0.02	0.03	0.06
Intangibles	2876	0.27	0.25	0.07	0.21	0.42
R&D	2876	0.04	0.06	0.00	0.01	0.06
Investment	2876	0.12	0.11	0.05	0.09	0.16
Free cash flow	2876	0.07	0.08	0.03	0.07	0.12
Surplus cash	2876	0.11	0.10	0.05	0.10	0.16
(Cash flow)	2876	0.04	0.04	0.01	0.03	0.05
Loss	2876	0.15	0.36	0.00	0.00	0.00

Table 4.2 presents summary statistics for our main variables. Panel A summarizes tax avoidance proxies. Panel B (C) presents statistics on CEO (CFO) executive compensation. Panel D uses firm-level control variables. The variable definitions are presented in Appendix A. All the continuous variables are winsorized at the first and 99th percentiles.

In Table 4.3, Panels A and B present the univariate analysis of the CEO and CFO samples, respectively. Each sample is split into high versus low inside debt holdings. We define firms with inside debt above the sample median as the group with high debt and firms with inside debt below the below median as the group with low debt. Consistent with H1, we find that the UTBs are statistically different from each other between the two groups: In the low inside debt sample, the mean *UTB* value is significantly higher (0.0164) than in the high inside debt sample (0.0128). This result holds for both CEOs and CFOs.

Panels C and D of Table 4.3 present the univariate correlations between inside debt compensation and tax avoidance measures for the CEO and CFO samples, respectively. Consistent with H1, the correla-

tion between the inside debt compensation variables and the measure
of tax risk is negative and significant. In addition, inside debt is posi-
tively and significantly correlated with the one-year *Cash ETR*. This is
again consistent with H1.

Table 4.3 – Univariate analysis and correlation matrix

Panel A: CEO sample			
	High Inside Debt Ratio	*Low Inside Debt Ratio*	
	Mean	Mean	Δ
UTB	0.0128	0.0164	-0.0036***
Test statistic			-5.16
N	1556	1320	

Panel B: CFO sample			
	High Inside Debt Ratio	*Low Inside Debt Ratio*	
	Mean	Mean	Δ
UTB	0.0132	0.0168	-0.0037***
Test statistic			-5.04
N	1464	1246	

Panel C: CEO sample						
		I	*II*	*III*	*IV*	*V*
I.	UTB	1.000				
II.	Cash ETR	-0.1061***	1.000			
III.	Cash ETR 3	-0.1207***	0.6122***	1.000		
IV.	CEO Inside Debt Ratio	-0.0580***	0.0448***	0.0105	1.000	

V.	CEO High Inside Debt Ratio	-0.0989***	0.0377**	0.0119	0.6371***	1.000

Panel D: CFO sample

		I	*II*	*III*	*IV*	*V*
I.	UTB	1.000				
II.	Cash ETR	-0.1121***	*1.000*			
III.	Cash ETR 3	-0.1264***	*0.6280****	*1.000*		
IV.	CFO Inside Debt Ratio	-0.0273	*-0.0057*	*-0.0411*	*1.000*	
V.	CFO High Inside Debt Ratio	-0.0991	*0.0396****	0.6088	*0.4275****	*1.000*

This table presents univariate analysis and correlation matrix. Panels A and B present the univariate analysis results for the CEO and CFO samples, respectively. The samples are split into High Inside Debt Ratio and Low Inside Debt Ratio around the sample median. Panels C and D present the Pearson correlations for the CEO and CFO samples, respectively. Significant correlations are in bold. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. For detailed variable definitions, see Appendix 4.A. All the continuous variables are winsorized at the first and 99th percentile.

4.6 Empirical results

4.6.1 Relation between inside debt and tax risk (H1 and H2)

Table 4.4 presents the results from estimating the simultaneous equations model that examines the relation between tax risk and CEO inside debt compensation, thus testing H1. Panel A shows the results from estimating equation (1) using two alternative measures of in-side debt holdings as independent variables. We use the ratio of CEO inside debt holdings over total compensation (Inside Debt Ratio) in model (1). In model (2), we use an indicator variable equal to one if Inside Debt Ratio is above the median and zero otherwise (High Inside Debt). Consistent with H1, we find evidence of significant associations between inside debt compensation and tax risk for both inside debt variables.

Importantly, the magnitude of the association between inside debt and tax risk is economically significant. Specifically, we find that a one standard deviation increase in inside debt ratio is accompanied by a 19.95% decrease in UTBs scaled by lagged total assets (i.e., tax risk).[10] One implication of our results is that inside debt appears to reduce the risk managers take in tax positions. The coefficients of our control variables are generally consistent with the prior literature. Specifical-ly, the coefficient of Vega is positive and significant consistent with prior literature (Rego & Wilson, 2012). We find higher *UTB* values (*i.e.*, more tax aggressiveness) in larger firms and firms with a more volatile ROA, lower leverage, more R&D, and foreign income.

Table 4.4 - CEO inside debt and tax risk (simultaneous equation model)

Panel A: Dependent variable UTB				
	(1)		(2)	
	Coeff.	*t-Stat*	*Coeff.*	*t-Stat*
CEO Inside Debt Ratio	**-0.0133***	**-1.93**		
CEO High Inside Debt Ratio			**-0.0076****	**-2.35**

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[10] For example, multiplying the coefficient (-0.0133) by one standard deviation of *Inside Debt Ratio* (0.15) and dividing by the mean of *UTB* (0.01) yields a ratio of 19.95%.

Delta	-0.0010**	-2.44	-0.0012***	-2.70
Vega	0.0012***	4.18	0.0013***	4.43
Size	0.0017***	4.25	0.0021***	4.28
Pre-Tax ROA	-0.0166***	-3.81	-0.0154***	-3.48
NOL	0.0001	0.16	0.0003	0.32
NOL	0.0077**	2.02	0.0080**	2.07
FCF	0.0128**	2.29	0.0117**	2.05
(Cash Flow)	-0.0362***	-3.42	-0.0379***	-3.53
Foreign	0.0727***	9.20	0.0755***	9.24
Leverage	-0.0024	-1.21	-0.0021	-1.04
Intangibles	-0.0021	-1.35	-0.0030*	-1.78
R&D	0.0886***	11.54	0.0791***	8.14
Capx	0.0014	0.17	-0.0001	-0.02
Discr. Acc.	0.0150**	2.28	0.0170**	2.52
(ROA)	0.0328***	4.33	0.0329***	4.31
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
N	2876		2876	
R^2	0.26		0.25	

Panel B: Dependent variable CEO Inside Debt

	(1)		(2)	
	Coeff.	t-Stat	Coeff.	t-Stat
UTB	0.5418	1.02	-1.5363	-0.87
Delta	-0.0521***	-16.03	-0.1139***	-10.46
Vega	0.0044*	1.74	0.0181**	2.15
Age	0.0042***	10.38	0.0063***	4.60
Tenure	0.0011**	2.07	0.0017	0.98
Turnover	-0.0464***	-5.23	-0.1665***	-5.61
Chairman	0.0393***	7.04	0.0643***	3.44
Surplus Cash	-0.0702**	-2.01	-0.2898**	-2.48

Investment	-0.0932***	-3.45	-0.3772***	-4.17
MtB	0.0032***	3.04	0.0075**	2.12
Size	0.0386***	14.57	0.1306***	14.73
Loss	-0.0050	-0.61	-0.0399	-1.46
(Ret)	-0.1001***	-5.20	-0.3457***	-5.36
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
N	2876		2876	
R^2	0.33		0.28	

This table presents the regression results for the simultaneous equation model. Panel A shows the results from estimating equation (1) in which the dependent variable is *UTB*. In model (1), the independent variable is *Inside Debt Ratio*; in model (2), the independent variable is *High Inside Debt Ratio*. Panel B shows the results from estimating equation (2). Each model includes industry (two-digit SIC) and year fixed effects. The p-values are two tailed. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles. All the variables are calculated as described in Appendix A.

Panel B of Table 4.4 shows the estimation results from equation (2). The coefficients of *UTB* are insignificant in both models (1) and (2), suggesting that the estimation model relaxes endogeneity concerns. The coefficients of the control variables show that *AGE* and *TENURE* are positively associated with inside debt and that the latter decreases in the year when a new CEO enters the firm. Moreover, *Inside Debt Ratio* is higher for those CEOs who are also the chair of the board. The variables *SURPLUS CASH, INVESTMENT,* and *(Ret)* are all negatively associated with inside debt holdings.

As a robustness test, we use a lagged specification model following Cassell et al. (2012) to control for the potential endogeneity between the executive compensation structure and firm tax planning decisions. The results are presented in Table 4.5. We find a negative association between lagged inside debt and UTBs for both alternative proxies of inside debt holdings. Table 4.5 thus supports the results of the two-stage least squares estimations, confirming the role of inside

debt holdings in incentivizing the CEO to act more conservatively toward tax risk. Overall, the results in Tables 4.4 and 4.5 support H1 and suggest that an increase in inside debt compensation is negatively associated with corporate tax risk.

Table 4.5 CEO inside debt and tax risk (OLS regression

Dependent variable UTB				
	(1)		(2)	
	Coeff.	t-Stat	Coeff	t-Stat
CEO Inside Debt Ratio$_{t-1}$	**-0.0059***	**-1.86**		
CEO High Inside Debt Ratio $_{t-1}$			**-0.0034*****	**-3.16**
Delta $_{t-1}$	-0.0095*	-1.70	-0.0010*	-1.91
Vega $_{t-1}$	0.0014**	2.45	0.0014**	2.51
Size	0.0018***	2.60	0.0020***	2.89
MtB	0.0009***	3.13	0.0009***	3.13
Pre-Tax ROA	-0.0248***	-3.25	-0.0247***	-3.25
NOL	0.0003	0.21	0.0004	0.25
NOL	0.0081	1.32	0.0081	1.32
FCF	0.0162**	2.26	0.0157**	2.21
(Cash Flow)	-0.0322*	-1.81	-0.0329*	-1.84
Foreign	0.0846***	4.38	0.0816***	4.46
Leverage	-0.0138***	-3.94	-0.0134***	-3.87
Investment	0.0261***	4.41	0.0248***	4.22
Discr. Acc.	0.0059	0.77	0.0074	0.95
(ROA)	0.0358***	2.82	0.0359***	2.81
Age	-0.0000	-0.05	-0.0000	-0.03
Tenure	-0.0000	-0.22	-0.0000	-0.20
Turnover	0.0003	0.25	0.0002	0.15
Chairman	-0.0016	-1.44	-0.0016	-1.40
Loss	0.0001	0.09	0.0011	0.08

(Ret)	0.0061	1.55	0.0052	1.32
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
N	2790		2790	
R^2	0.25		0.26	

This table presents the OLS regression results where the dependent variable is *UTB*. In model (1), the independent variable is *Inside Debt Ratio* and, in model (2), the independent variable is *High Inside Debt Ratio*. All the compensation variables are lagged one year. The variable definitions are provided in Appendix A. Each model includes industry (two-digit SIC) and year fixed effects. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles. All the variables are calculated as described in Appendix 4.A.

To investigate H2, we test the lagged specification using a quantile regression. Figure 4.1 is a visual representation of the estimated coefficients over the 99 percentiles along with the upper and lower 90% confidence intervals. The coefficients are estimated using standard errors clustered at the firm level. Figure 1 depicts a concave relation between inside debt holdings and tax risk, consistent with the non-linearity hypothesis. For the first quartile of tax risk, the relation between tax risk and high inside debt compensation is positive but not statistically significant. The coefficient estimates become negative and statistically significant above the 39th percentile. Further, the association becomes increasingly negative for higher quantiles of tax risk. Importantly, the confidence intervals between the lowest quartile and most quantiles above the median do not overlap. This indicates that the coefficient estimates are also statistically different from each other. Taken together, these results suggest that, while the association between inside debt compensation and tax risk is negative across almost the entire distribution, it becomes more pronounced as UTBs increase. One implica-

tion of these results is that inside debt plays a stronger role in miti-
gating executives' risk-taking behavior toward tax planning when the
level of tax risk is higher.

Figure 4.1 - Distribution of the tax risk coefficient estimated at different quantiles
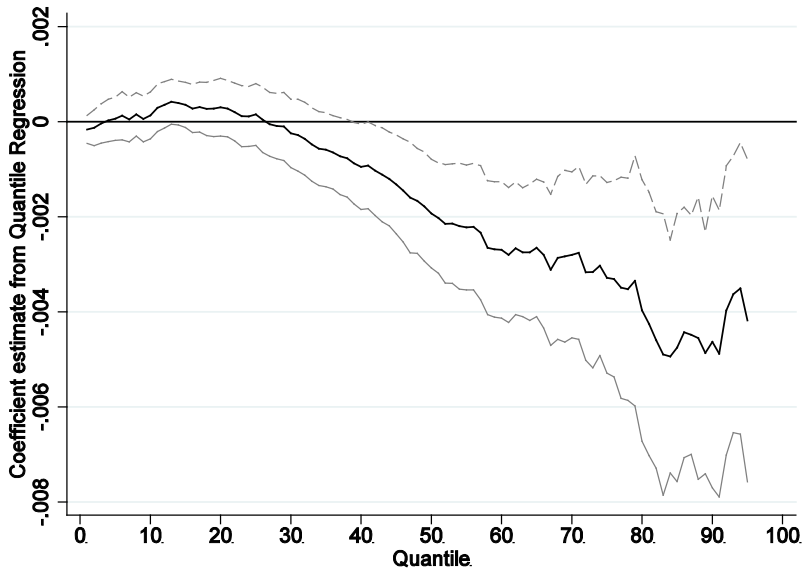
This figure plots the quantile estimates of the coefficient of *Tax Risk*.

We estimate the *Tax Risk* coefficient separately for each quantile us-
ing equation (3). The upper 90% confidence bounds (dotted line) and
lower 90% confidence bounds (solid line) are also presented.

4.6.2 Cross-sectional analysis (H3 and H4)

In this section, we first investigate H3 and test whether financial
constraints and cash availability moderate or enhance the negative
association between inside debt holdings and tax risk. Reducing the
tax burden increases after-tax cash flows and decreases the probability
of default. However, this has negative consequences on future cash
flow levels and volatility. We argue that, for firms that need cash, the

increase in after-tax cash flows could dominate the risk argument. Therefore, we expect inside debt holdings to be able to curb risk, particularly when firms are not under liquidity constraints and have high cash availability. Finding these results when expected could also shed light on the causal relation between inside debt and tax avoidance.

Column (1) of Table 4.6 presents the results of the cross-sectional analysis of liquidity constraints. The variable *High Surplus Cash* defines firms with *Surplus Cash* above the 75th percentile. The coefficient of *High Inside Debt Ratio* is negative and significant (-0.0019), consistent with H1. The coefficient of interest of the interaction term between *High Inside Debt Ratio* and *High Surplus Cash* is also negative and significant (-0.0042). This result is consistent with H3. The responsiveness of tax risk to inside debt holdings increases by over 200% (= −0.042/(−0.0013)) if firms have high surplus cash. Moreover, the sum of the two coefficients (-0.0061) is significantly different from zero (p-value = 0.002). We interpret this result as inside debt curbing tax risk in firms that have cash available at hand, while the effect is weaker in financially constrained firms.

Next, we examine the role played by corporate governance in the association between inside debt holdings and tax risk (H4). We expect that, in firms with high institutional ownership, governance and monitoring mechanisms are in place that substitute for the inside debt component of compensation. Column (2) of Table 4.6 presents the regression results from estimating equation (5) to examine this prediction. The coefficient of *High Inside Debt Ratio* is negative and significant (-0.0056), consistent with H1. As expected, the coefficient of *High Institutional Holdings* is also negative and significant (-0.0053). Most importantly, the coefficient of interest of the interaction term between *High Inside Debt Ratio* and *High Institutional Holdings* is positive and significant (0.0099). This result suggests a substitution effect between institutional ownership and inside debt compensation. In firms with strong monitoring by institutional owners, inside debt compensation is no longer associated with a decreased tax risk: The sum of the coefficient of *High Inside Debt Ratio* and that of the interaction term (0.0044) is not significantly different from zero (p-value = 0.4383).

Table 4.6 Cross-sectional analysis

Dependent variable: UTB				
	(1)		(2)	
	Coeff.	t-Stat	Coeff	t-Stat
CEO High Inside Debt Ratio $_{t-1}$	-0.0019*	-1.70	-0.0056*	-1.81
High Surplus Cash $_{t-1}$	0.0048***	2.75		
High ID × High SC	**-0.0042***	**-1.90**		
High Institutional Holdings			-0.0053**	-2.14
High ID × High IH			**0.0099***	**1.97**
Controls	Yes			
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
N	2771		496	
R^2	0.25		0.44	
p-Value	0.002		0.4383	

This table presents OLS regression results in which the dependent variable is *UTB*. The variable *High Surplus Cash* is a dummy variable equal to one when *Surplus Cash* is above the 75th percentile and zero otherwise; *High ID × High SC* is the interaction term between *CEO High Inside Debt Ratio$_{t-1}$* and *High Surplus Cash$_{t-1}$*; *High Institutional Holdings* is a dummy variable equal to one when *Institutional Holdings* is above the 75th percentile and zero otherwise; and *High ID × High IH* is the interaction term between *CEO High Inside Debt Ratio$_{t-1}$* and *High Institutional Holdings*. All the compensation variables are lagged one year. The variable definitions are provided in Appendix 4.A. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles.

4.6.3 Additional analysis: CFO inside debt

Our first additional tests are centered on the role of the CFO. In contrast to the CEO, the CFO's responsibilities are closer to the daily

operations of the tax unit. To this end, we examine whether our re-
sults on H1 also hold for the inside debt compensation of the CFO.
Table 4.7 presents the regression results from estimating equations (1)
and (2) in a simultaneous equation model. Consistent with H1 and the
results using CEO inside debt, CFO inside debt holdings are negatively
associated with tax risk. The coefficient of *Inside Debt Ratio* is 0.0129,
whose economic magnitude is quite comparable to that for the CEO
sample. Specifically, we find that a one standard deviation increase
in the inside debt ratio is accompanied by a 19.35% decrease in UTBs
scaled by lagged total assets (*i.e.*, tax risk). This result implies that
higher inside debt induces CFOs to act more conservatively toward
tax risk. The coefficients of our control variables are generally consis-
tent with the prior results on CEOs.

Table 4.7 CFO inside debt and tax risk (simultaneous equation model)

Panel A: Dependent variable UTB				
	(1)		(2)	
	Coeff.	t-Stat	Coeff.	t-Stat
CFO Inside Debt Ratio	-0.0129*	-1.73		
CFO High Inside Debt Ratio			-0.0092*	-1.80
Delta	-0.0010**	-2.44	-0.0012***	-2.70
Vega	0.0012***	4.18	0.0013***	4.43
Size	0.0017***	4.25	0.0021***	4.28
Pre-Tax ROA	-0.0166***	-3.81	-0.0154***	-3.48
NOL	0.0001	0.16	0.0003	0.32
NOL	0.0077**	2.02	0.0080**	2.07
FCF	0.0128**	2.29	0.0117**	2.05
(Cash Flow)	-0.0362***	-3.42	-0.0379***	-3.53
Foreign	0.0727***	9.20	0.0755***	9.24
Leverage	-0.0024	-1.21	-0.0021	-1.04
Intangibles	-0.0021	-1.35	-0.0030*	-1.78

R&D	0.0886***	11.54	0.0791***	8.14
Capx	0.0014	0.17	-0.0001	-0.02
Discr. Acc.	0.0150**	2.28	0.0170**	2.52
(ROA)	0.0328***	4.33	0.0329***	4.31
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
N	2710		2710	
R^2	0.25		0.23	

Panel B: Dependent variable CFO Inside Debt

	(1)		(2)	
	Coeff.	t-Stat	Coeff.	t-Stat
UTB	0.5418	1.02	-1.5363	-0.87
Delta	-0.0521***	-16.03	-0.1139***	-10.46
Vega	0.0044*	1.74	0.0181**	2.15
Age	0.0042***	10.38	0.0063***	4.60
Tenure	0.0011**	2.07	0.0017	0.98
Turnover	-0.0464***	-5.23	-0.1665***	-5.61
Chairman	0.0393***	7.04	0.0643***	3.44
Surplus Cash	-0.0702**	-2.01	-0.2898**	-2.48
Investment	-0.0932***	-3.45	-0.3772***	-4.17
MtB	0.0032***	3.04	0.0075**	2.12
Size	0.0386***	14.57	0.1306***	14.73
Loss	-0.0050	-0.61	-0.0399	-1.46
(Ret)	-0.1001***	-5.20	-0.3457***	-5.36
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
N	2710		2710	
R^2	0.29		0.28	

This table presents the regression results for the simultaneous equation model. Panel A shows the results from estimating equation (1) in which the dependent variable is *UTB*. In model (1), the independent variable is *CFO Inside Debt Ratio* and, in model (2), the independent variable is *CFO High In-*

side Debt Ratio. Panel B shows the results from estimating equation (2). Each model includes industry (two-digit SIC) and year fixed effects. The p-values are two tailed. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles. All the variables are calculated as described in Appendix 4.A.

As a sensitivity test, we again use the lagged specification model following Cassell et al. (2012) to control for the potential endogeneity between the executive compensation structure and firm tax planning decisions. Table 4.8 supports the results of the two-stage least squares estimations. We again find a negative association between inside debt and UTBs, confirming the role of inside debt holdings in reducing CFOs' risk-taking behavior in tax planning.

Table 4.8 - CFO inside debt and tax risk (OLS regression)

Dependent variable UTB				
	(1)		*(2)*	
	Coeff.	*t-Stat*	*Coeff*	*t-Stat*
CFO Inside Debt Ratio$_{t-1}$	0.0003	0.09		
CFO High Inside Debt Ratio$_{t-1}$			**-0.0029****	**-2.52**
Controls	Yes		Yes	
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
N	2572		2572	
R^2	0.26		0.26	

This table presents the OLS regression results in which the dependent variable is *UTB*. In model (1), the independent variable is *CFO Inside Debt Ratio* and, in model (2), the independent variable is *CFO High Inside Debt Ratio*. All the compensation variables are lagged one year. The variable definitions are provided in Appendix A. Each model includes industry (two-digit SIC) and year fixed effects. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

4.6.4 The cost of reducing tax risk

In the final step, we examine the potential costs of reducing tax risk. To be more precise, we examine the potential consequences at the tax level. In line with previous research (Chi et al., 2017; Kubick et al., 2020), we expect inside debt holdings to be negatively associated with the level of tax avoidance. In Table 4.9, we test equations (1) and (2) using the one-year *Cash ETR* (model 1) and the three-year *Cash ETR* (model 2) as tax variables for both the CEO (Panels A and B) and CFO (Panels C and D) samples.

We find that the ratio of CEO inside debt is positively association with *Cash ETR* (*i.e.*, greater inside debt to overall compensation is associated with a decrease in the level of tax avoidance). The coefficient of *CEO Inside Debt Ratio* is positive (+0.2466) and significant. Economically, a one standard deviation increase in inside debt ratio is accompanied by a 14.23% increase in *CashETR*. The results also hold when we use a dummy for high inside debt holdings as the independent variable. Surprisingly, it appears that the relation is no longer significant when we use the long-term *Cash ETR*. The coefficient of *CEO Inside Debt Ratio* is no longer significant when we use *CashETR3* as a dependent variable.

The results for the CFO sample are not quite as strong. First, there is no significant association with the one-year *Cash ETR* when using the continuous measure *Inside Debt Ratio*. However, the coefficient of the *High Inside Debt Ratio* dummy is 0.2633 and significant. Second, the sign of the association with the three-year *Cash ETR* is not as expected. Furthermore, it appears that the simultaneous equation model cannot rule out endogeneity concerns, since the coefficient of the three-year *Cash ETR* in Panel D is also significant and we cannot establish the direction of the relation. These findings suggest that inside debt holdings are also associated with the ETR. The reduction in tax risk appears to come only at the cost of a short-term increase in tax payments and is not associated with an increase in long-term tax payments.

Table 4.9 - CEO and CFO inside debt and the level of tax avoidance (simulta-

neous equation model)

Panel A: Dependent variables Cash ETR (1) and Cash ETR 3 (2)

	(1)		(2)	
	Coeff.	Coeff.	Coeff.	Coeff.
CEO Inside Debt Ratio	**0.2466*****		0.0516	
	(3.43)		(0.68)	
CEO High Inside Debt Ratio		**0.1373*****		0.0369
		(4.06)		(1.04)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	3552	3552	2317	2317
R^2	0.11	0.05	0.14	0.14

Panel B: Dependent variable CEO Inside Debt

	(1)		(2)	
	Coeff.	Coeff.	Coeff.	Coeff.
Cash ETR	-0.0557	-0.1862	-0.1332	-0.5772**
	(-1.07)	(-1.02)	(-1.63)	(-2.00)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	3552	3552	2317	2317
R^2	0.34	0.29	0.35	0.27

Panel C: Dependent variables Cash ETR (1) and Cash ETR 3 (2)

	(1)		(2)	
	Coeff.	Coeff.	Coeff.	Coeff.
CFO Inside Debt Ratio	0.0483		**-0.1595****	
	(0.61)		**(-2.06)**	
CFO High Inside Debt Ratio		**0.2633*****		0.0280
		(4.60)		(0.56)
Controls	Yes	Yes	Yes	Yes

	(1)		(2)	
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	3136	3136	2018	2018
R²	0.13	-0.17	0.13	0.14

Panel D: Dependent variable CFO Inside Debt

	(1)		(2)	
	Coeff.	Coeff.	Coeff.	Coeff.
Cash ETR	-0.0635	0.2560	-0.2195**	-0.3981
	(-1.17)	(1.34)	(-2.44)	(-1.32)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	3136	3136	2018	2018
R²	0.29	0.28	0.26	0.28

This table presents the regression results for the simultaneous equation model. In model (1), the dependent variable is the one-year *Cash ETR* and, in model (2), the dependent variable is the three-year *Cash ETR* (*Cash ETR 3*). Panel A shows the results from estimating equation (1) using the CEO sample. Panel B shows the results from estimating equation (2) using the CEO sample. Panel C shows the results from estimating equation (1) using the CFO sample. Panel D shows the results from estimating equation (2) using the CFO sample. Each model includes industry (two-digit SIC) and year fixed effects. The p-values are two tailed. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. All the continuous variables are winsorized at the first and 99th percentiles. All the variables are calculated as described in Appendix 4.A.

To investigate this cost further, we examine the association between UTBs and cash ETRs while controlling for executive compensation measures (including inside debt holdings) and other determinants of tax avoidance (e.g., Dyreng et al., 2008, 2010). We use the one-year measure of *Cash ETR* and another measure of the three-year *Cash ETR* that is computed around year t (*i.e.*, from year t - 1 to year t + 1) to account for timing issues of the ETR measure. Table 4.10 presents the regression results. We find that *UTB* is negatively and significantly associated with *Cash ETR*. This result suggests that higher UTB values will translate into greater tax avoidance. Put differently, higher tax risk is associated

with lower ETRs. Therefore, as long as inside debt holdings act as a constraining mechanism in tax risk, this association should also translate into less tax avoidance.

Table 4.10 - Cost of reducing tax risk

Dependent variables Cash ETR (1) and Cash ETR 3 (2)*				
	(1)		*(2)*	
	Coeff.	*t-Stat*		*t-Stat*
UTB	**-0.7744*****	**-2.66**	**-0.6847****	**-2.29**
CEO Inside Debt Ratio $_{t-1}$	-0.0091	-0.24	0.0066	0.16
Controls	Yes		Yes	
Year FE	Yes		Yes	
Industry FE	Yes		Yes	
N	2560		1560	
R^2	0.12		0.15	

This table presents the OLS regression results in which the dependent variable is, in model (1), the one-year *Cash ETR* and, in model (2) the three-year *Cash ETR* computed in years *t* - 1, *t*, and *t* + 1 (*Cash ETR 3**). All the compensation variables are lagged one year. The variable definitions are provided in Appendix A. Each model includes industry (two-digit SIC) and year fixed effects. The p-values (two tailed) are based on robust standard errors adjusted for heteroscedasticity and clustered by firm. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

4.7 Conclusion

This chapter has provided a comprehensive analysis of the relationship between executives' inside debt holdings and corporate tax risk, emphasizing the moderating role of corporate governance (Jensen & Meckling, 1976). The findings underscore the importance of aligning managerial incentives with the long-term interests of debtholders and highlight the broader implications for corporate tax planning strategies. By examining the risk dimension of tax avoidance, this study contributes to a deeper understanding of how executive compensation structures influence corporate decision-making and financial stability.

We extend the literature on executive compensation and corporate tax planning strategies (Desai & Dharmapala, 2006; Rego & Wilson,

2012; Armstrong et al., 2015; Kubick et al., 2020; Chi et al., 2017) by focusing on CEO and CFO inside debt holdings at different quantiles and by providing further evidence on the possible determinants of the tax undersheltering puzzle. The central conclusion is that inside debt, as a component of executive compensation, serves as an effective mechanism for mitigating corporate tax risk. Unlike equity-based compensation, which often encourages risk-taking to maximize shareholder returns, inside debt aligns executives' financial interests with the conservative preferences of debtholders. This alignment incentivizes executives to adopt less aggressive tax strategies, reducing the uncertainty and potential volatility associated with corporate tax positions. The findings reveal a robust negative relationship between inside debt holdings and tax risk, as measured by unrecognized tax benefits (UTBs). Specifically, a one-standard-deviation increase in inside debt holdings is associated with a 20% decrease in UTBs, providing strong empirical support for the hypothesis.

The relationship between inside debt and tax risk is particularly pronounced in firms with higher levels of tax uncertainty. Using quantile regression analysis, this study demonstrates that the mitigating effect of inside debt intensifies as tax risk increases. This non-linear relationship highlights the adaptability of inside debt as a governance tool, particularly in contexts where the stakes are higher. These findings align with prior research by Kubick et al. (2020) and Chi et al. (2017), which also emphasize the context-dependent nature of executive compensation mechanisms.

Beyond the direct relationship between inside debt and tax risk, this study explores two critical moderating factors: liquidity constraints and corporate governance strength. First, the analysis reveals that the effectiveness of inside debt in reducing tax risk is stronger in firms that are not facing liquidity constraints. In such firms, the availability of surplus cash reduces the pressure on executives to pursue aggressive tax strategies to generate immediate cash flow benefits. Instead, managers with substantial inside debt holdings prioritize long-term stability over short-term gains, resulting in a more conservative approach to tax planning. Conversely, in firms with liquidity constraints,

the need for immediate cash flow may override the conservative incentives provided by inside debt, weakening its impact on tax risk.

Second, the strength of corporate governance emerges as a key factor moderating the relationship between inside debt and tax risk. Using institutional ownership as a proxy for governance quality, the study identifies a substitution effect between institutional ownership and inside debt. In well-governed firms with high levels of institutional ownership, the monitoring role of institutional investors reduces the need for inside debt to act as a risk-mitigating mechanism. This finding underscores the complementary and substitutive roles of different governance tools in shaping corporate behavior. In contrast, in firms with weaker governance structures, inside debt compensation becomes a more critical mechanism for aligning managerial incentives with debtholders' risk preferences.

These findings have several important implications for theory, practice, and policy. From a theoretical perspective, this study contributes to the literature on executive compensation and corporate tax planning by shifting the focus from the level of tax avoidance to the risk dimension of tax strategies. While prior research has predominantly examined the extent to which firms engage in tax avoidance, this study sheds light on the implications of tax planning decisions for financial stability and firm value. By emphasizing the role of inside debt in mitigating tax risk, the findings provide a more nuanced understanding of how compensation structures influence corporate behavior.

From a practical standpoint, the results underscore the importance of designing executive compensation packages that balance risk and reward. By incorporating inside debt into compensation structures, firms can align managerial incentives with the long-term interests of both shareholders and debtholders. This alignment not only reduces tax risk but also promotes a more stable and predictable financial environment, which is critical for long-term value creation. Moreover, the findings highlight the need for firms to consider the broader governance context when designing compensation packages. In well-governed firms with strong institutional oversight, the role of inside debt may be less critical, allowing for greater flexibility in compensation

design. However, in firms with weaker governance structures, inside debt compensation can serve as a valuable tool for mitigating risk and promoting stability.

The policy implications of this study are equally significant. Policymakers seeking to promote corporate transparency and stability should recognize the role of executive compensation structures in shaping tax planning behaviors. By encouraging the adoption of inside debt compensation, regulators can incentivize firms to adopt more conservative and sustainable tax strategies. Additionally, the findings underscore the importance of considering the broader governance and liquidity context when designing tax policies. For example, reforms aimed at curbing aggressive tax avoidance should account for the moderating effects of executive compensation and governance structures to ensure that the desired outcomes are achieved.

Finally, this study opens several avenues for future research. Future studies could examine the long-term effects of inside debt compensation on firm performance and value, particularly in the context of changing regulatory environments. The interaction between inside debt and other governance mechanisms, such as board composition, shareholder activism, and external monitoring, also warrants further investigation to provide a more comprehensive understanding of the factors influencing corporate tax strategies.

In conclusion, this chapter provides robust evidence that inside debt compensation serves as an effective mechanism for mitigating corporate tax risk. By aligning the risk preferences of executives with those of debtholders, inside debt encourages a more conservative approach to tax planning, reducing the uncertainty associated with aggressive tax strategies. These findings have significant implications for researchers, practitioners, and policymakers, offering valuable insights into the design of executive compensation packages, the role of corporate governance, and the broader dynamics of corporate tax planning. As firms navigate an increasingly complex tax and regulatory environment, the insights from this study can inform strategies to promote financial stability, transparency, and long-term value creation.

Appendix 4.A

Variable definition	
Dependent variables	
UTB	TXTUBEND scaled by lagged total assets.
Cash ETR	Taxes paid (TXPD) scaled by pre-tax income less special items (PI - SPI). The variable is bounded between 0 and 1.
Cash ETR 3	The three-year sum of taxes paid (TXPD) divided by the three-year sum of pre-tax income minus special items (PI - SPI). The three years cover from the current year t to the following two years (t + 1 and t + 2). The variable is bounded between 0 and 1.
Independent variables	
CEO and CFO variables	
CEO/CFO Inside Debt Ratio	The ratio of the sum of the present value of accumulated pension and deferred compensation over the value of total compensation.
CEO/CFO High Inside Debt Ratio	An indicator variable equal to one when *Inside Debt Ratio* is above the median and zero otherwise.
CEO/ CFO Log Inside Debt	The natural log of the sum of the present value of accumulated pension and deferred compensation.
CEO/CFO Delta	The natural logarithm of the option delta computed as 1% × (share price) × (number of shares held) + 1% × (share price) × (option delta) × (number of options held).
CEO/CFO Vega	The natural logarithm of the sensitivity of the change in the Black–Scholes option value for a 1% change in stock return volatility multiplied by the number of options in the CEO's or CFO's portfolio.
CEO/CFO Age	The age of the executive in fiscal year t.
CEO Tenure	The tenure of the CEO in fiscal year t.
CEO Turnover	An indicator variable equal to 1 when there is a new CEO and zero otherwise.
Chairman	An indicator variable equal to 1 when the CEO is also the chair of the board and zero otherwise.
Firm-level variables	

SIZE	The natural logarithm of the firm's total assets (AT).
BtM	The book-to-market ratio calculated as total common equity (CEQ) divided by common shares outstanding (CSHO) multiplied by the stock price at the fiscal year-end (PRCC F).
LEVERAGE	Total debt (DLC + DLTT) scaled by total assets (AT).
FOREIGN	Pre-tax foreign income (PIFO).
σ(Ret)	The 60-month stock price return volatility.
Pre-Tax ROA	The pre-tax ROA.
σ(ROA)	The three-year Pre-Tax volatility of ROA.
NOL	An indicator variable equal to one if the firm has net operating loss carryforwards and zero otherwise.
Discr. Acc.	Discretionary accruals calculated using the performance-adjusted modified Jones model.
CAPX	Capital expenditures (CAPX) scaled by total assets (AT) at the beginning of the year.
R&D	R&D expenses (XRD) scaled by total assets (AT) at the beginning of the year.
INVESTMENT	Total investments, calculated as the sum of R&D expenditures (XRD), acquisitions (AQC), and net capital expenditures—*i.e.*, capital expenditures (CAPX) less the sales of property, plant, and equipment (SPPE)—divided by average total assets (AT).
Surplus Cash	Net cash flows from operating activities minus depreciation plus R&D expenses scaled by lagged total assets.
FCF	Free cash flow computed as net cash flows from operating activities minus capital expenditures scaled by lagged total assets.
CF vol	The three-year volatility of EBITDA scaled by lagged total assets.
High INSTITUTIONAL HOLD	An indicator variable equal to 1 when the percentage of institutional ownership is above the 75th percentile and zero otherwise.

High SURPLUS CASH	An indicator variable equal to 1 when surplus cash is above the 75th percentile and zero otherwise.

Chapter 5 CEO equity risk incentives and corporate tax avoidance: Evidence from the banking industry

5.1 Overview

The structure of executive compensation has long been a focal point of debate, particularly in light of its role in fostering excessive risk-taking in the banking industry. This chapter delves into the relationship between equity risk incentives embedded in banks' CEO compensation packages and their association with aggressive corporate tax strategies. The topic holds particular relevance given the unique characteristics of the banking sector, where high leverage, government guarantees, and the absence of market discipline create an environment conducive to risk-taking. These factors not only amplify the impact of compensation structures but also underscore the critical importance of understanding how these incentives influence managerial behavior.

Historically, executive compensation in the banking industry has been criticized for its role in encouraging short-termism and excessive risk-taking, especially in the years leading up to the Global Financial Crisis. The crisis exposed significant flaws in the design of compensation packages, which often prioritized immediate financial gains over long-term stability. Equity-based compensation, in particular, has been identified as a key driver of this behavior. By tying a significant portion of executives' wealth to stock price performance, such compensation structures incentivize higher levels of risk-taking, as executives stand to benefit from the upside potential of risky deci-

sions while being partially insulated from the downside. This dynamic is especially pronounced in the banking sector, where the inherent moral hazard created by government guarantees further exacerbates the problem.

The relationship between equity risk incentives and corporate tax avoidance is an understudied yet critical area of research. Tax avoidance, defined as any legal strategy to minimize a firm's tax liability, spans a continuum from routine tax planning to more aggressive practices that push the boundaries of legality. While tax avoidance can yield immediate financial benefits, it also carries significant risks, including regulatory scrutiny, reputational damage, and potential legal challenges. For banks, these risks are compounded by their central role in the financial system and their heightened visibility to regulators and the public. This chapter seeks to bridge the gap in the literature by exploring how equity risk incentives influence banks' tax strategies, shedding light on the broader implications for corporate governance and financial stability.

The findings presented in this chapter contribute to several strands of literature. First, they add to the growing body of research on the determinants of corporate tax avoidance, particularly in the context of financial institutions (Gallemore et al., 2019; Hanlon & Heitzman, 2010;Merz and Overesch, 2016). While much of the existing literature focuses on non-financial firms, the unique characteristics of banks—such as their regulatory environment, funding structure, and stakeholder composition—necessitate a more nuanced analysis. Second, the chapter contributes to the literature on executive compensation (Barro & Barro, 1990; Chen et al., 1998; Crawford et al.,1995; Fabrizi, 2021; Hubbard & Palia, 1995) by highlighting the role of equity risk incentives in shaping not only risk-taking behavior but also tax planning decisions. By examining the interplay between compensation structures and tax strategies, the study provides valuable insights into how managerial incentives align (or misalign) with broader organizational goals. Finally, the chapter offers practical implications for policymakers and practitioners, emphasizing the need for balanced

compensation structures that promote long-term value creation while mitigating excessive risk-taking.

The results of this study reveal a positive association between CEO equity risk incentives and corporate tax avoidance in the banking sector. Specifically, the analysis demonstrates that higher levels of equity risk incentives, as measured by the Vega-to-Delta ratio of CEO stock options, are associated with lower cash effective tax rates (Cash ETR). This finding suggests that CEOs with greater exposure to equity risk are more likely to engage in aggressive tax strategies, thereby reducing the share of cash taxes paid relative to pre-tax income. The relationship is particularly pronounced in the years leading up to the GFC, highlighting the role of deregulation and competitive pressures in shaping compensation structures that incentivize risk-taking. However, the study also finds that the association weakens in the post-crisis period, suggesting that regulatory reforms implemented in the aftermath of the GFC were effective in curbing some of the more extreme manifestations of risk-taking behavior.

In conclusion, this chapter provides a comprehensive analysis of the relationship between CEO equity risk incentives and corporate tax avoidance in the banking industry. By focusing on this unique sector, the study not only fills a critical gap in the literature but also offers valuable insights into the broader dynamics of executive compensation, corporate governance, and financial stability. As banks continue to navigate an increasingly complex regulatory and economic landscape, understanding the drivers of risk-taking and tax planning behavior remains a critical challenge for researchers, practitioners, and policymakers alike.

5.2 Risk-taking behavior and banks

Understanding the factors that drive risk-taking behavior in the banking industry, as well as the role of equity and risk-taking incentives, is crucial due to the unique characteristics of this sector. Banks, being highly leveraged institutions, have an inherent incentive to engage in excessive risk-taking, as noted by Jensen and Meckling (1976).

This tendency is further amplified by the nature of their funding sources. Banks raise debt primarily through depositors or direct access to Central Banks. Unlike other industries, an increase in a bank's risk profile does not necessarily lead to higher debt costs. Depositors, who are typically small, uninformed investors with government-insured deposits, lack both the motivation and capability to monitor banks' investment decisions. Moreover, the potential for contagion effects following the failure of a single bank prompts governments to provide explicit and implicit guarantees, further insulating banks from market discipline. Supporting this view, Haldane (2011) observed that, prior to the financial crisis, credit default swap markets failed to differentiate between strong and weak banks.

This absence of constraints from debt markets allows risk-taking incentives tied to stock and option compensation to operate unchecked. The problem is exacerbated when accounting standards undermine the effectiveness of capital adequacy requirements intended to curb excessive risk-taking (Fabrizi, 2021). Bolton et al. (2015) highlight how the risk-shifting problem is particularly severe in the banking sector, where debt levels often exceed 90%, and for investment banks, this figure approaches 95%. Banks also face a broader array of stakeholders—shareholders, debtholders, depositors, and executives—and are monitored externally by regulators and subordinated debt holders. Yet, the structural incentives within banks still strongly favor risk-taking.

The structure of executive compensation has been widely criticized for fostering excessive risk-taking, particularly in the lead-up to the global financial crisis. Several studies (Barro & Barro, 1990; Chen et al., 1998; Crawford et al.,1995; Hubbard & Palia, 1995) have examined the determinants of executive compensation in banking, often in the context of regulatory concerns tied to fixed-rate deposit insurance. Since depositors are insured against losses by the Federal Deposit Insurance Corporation (FDIC), they remain indifferent to the level of risk associated with a bank's investment and financing strategies. Consequently, bank shareholders have stronger incentives for risk-taking compared to shareholders of other leveraged firms. Whether these heightened incentives translate into riskier operational strategies depends on the

effectiveness of the incentives provided to bank managers and the regulatory policies designed to curb excessive risk-taking (Houston & James, 1995).

The collapse of several major financial institutions during the global financial crisis raised questions about the role of executive pay in encouraging risky behaviors. Research suggests that the design of executive compensation packages at large banks incentivized risk-taking behaviors that ultimately harmed the long-term value of these institutions (Guo et al., 2015). A notable example is the securitization of risky loans. Between 2000 and 2006, the volume of securitized loans nearly doubled, while the securitization of high-risk subprime mortgages increased eightfold, exceeding \$800 billion by the end of 2006 (Cerbioni et al., 2015). Fabrizi (2021) finds that CEOs with high equity risk incentives were more heavily involved in the securitization of risky loans, transferring risk to external investors by moving the riskiest loans off-balance sheet.

Equity risk incentives, which tie executives' compensation to the performance of company equity, play a central role in shaping risk-taking behavior. These incentives, often provided through stock options or equity holdings, align executives' personal wealth with the company's stock price performance, encouraging higher levels of risk in decision-making. Stock options, one of the most common forms of equity compensation, grant executives the right to purchase company shares at a predetermined price within a set period. While stock options align managerial rewards with share-price performance, promoting long-term decision-making, they also expose executives to external factors beyond their control, which can limit the effectiveness of this form of compensation.

The role of accounting in the banking industry further complicates the relationship between executive incentives and risk-taking. Previous research (Beatty et al., 2002; Beatty & Liao, 2014) categorizes bank accounting studies into three key areas: (1) the valuation and risk relevance of bank accounting information, (2) the use of accounting discretion to manage earnings and reported regulatory capital, and (3) the impact of accounting on banks' economic behaviors

before, during, and after the financial crisis. These studies highlight how accounting practices can influence managerial behavior and risk-taking incentives. For instance, Clinch and Magliolo (1993) find that CEO compensation is positively linked to discretionary earnings only when accompanied by cash flows, suggesting that earnings management unrelated to cash flows may not be motivated by CEO pay. Conversely, Livne et al. (2011) identify a positive relationship between CEO cash bonuses and fair value valuations, indicating that fair value manipulation could influence CEO compensation.

In conclusion, the unique characteristics of the banking sector, including high leverage, government guarantees, and the absence of market discipline, create strong incentives for excessive risk-taking. The structure of executive compensation, particularly equity risk incentives, has been identified as a key driver of this behavior, with significant implications for financial stability. While regulatory interventions and improved accounting practices can mitigate some of these risks, aligning managerial incentives with long-term value creation remains a critical challenge for the banking industry.

5.3 Banks' executive compensation and risk taking

Prior research in banking and finance has extensively examined the structure of executive compensation in the banking industry and its potential to promote risk-taking. Houston and James (1995) find that, on average, bank CEOs receive lower cash compensation, are less likely to participate in stock option plans, hold fewer stock options, and receive a smaller percentage of their total compensation in the form of options and stock compared to CEOs in other industries. Interestingly, their findings show no evidence that equity compensation incentivizes risk-taking. Instead, they observe a positive and significant association between equity compensation and a bank's charter value, suggesting that equity-based pay may align CEO incentives with long-term firm value rather than short-term risk-taking.

Chen et al. (2006) explore the relationship between option-based executive compensation and market measures of risk for commercial

banks from 1992 to 2000. Their findings indicate that, following deregulation, banks increasingly adopted stock option-based compensation, which was positively associated with risk-taking. This suggests that deregulation played a key role in shaping compensation structures that encouraged greater risk-taking.

Fahlenbrach and Stulz (2011) provide a nuanced perspective by analyzing the performance of banks during the financial crisis. They find that banks with CEO compensation closely aligned with shareholders' interests performed worse during the crisis. Specifically, higher option-based compensation for CEOs did not lead to worse performance, but there was no evidence that shareholder-aligned incentives improved performance either. In fact, these banks performed worse in terms of stock returns and accounting return on equity (ROE). The study also reveals that CEOs did not reduce their equity holdings in anticipation of the crisis, nor did they hedge their equity exposure, leading to significant wealth losses during the crisis. These findings suggest that CEO compensation structures were not the primary cause of the financial crisis, as supported by Acrey et al. (2011), who conclude that CEO pay does not explain bank risk or the crisis.

In contrast, DeYoung et al. (2010) investigate the influence of CEO compensation contracts on risk-taking in large commercial banks between 1994 and 2006. They find strong evidence that bank CEOs responded to contractual risk-taking incentives by taking on more risk. Bank boards adjusted CEO compensation to encourage executives to exploit new growth opportunities while simultaneously moderating excessive risk-taking. These dynamics were particularly pronounced in the latter part of the sample period, following deregulation and technological advancements that expanded banks' capacities for risk-taking.

Mehran and Rosenberg (2008) assess the impact of CEO stock options on key corporate policies, including investment choices, borrowing levels, and capital structure. Using a sample of publicly traded banks from 1992 to 2002, they find that stock option grants led CEOs to undertake riskier investments, resulting in higher levels of equity and asset volatility. Additionally, they show that option grants reduced

banks' reliance on borrowing, as evidenced by lower interest expenses and federal funds borrowing. These findings highlight the dual role of stock options as both a driver of risk-taking and a non-debt tax shield.

Bebchuck and Spamann (2009) delve into the broader implications of equity-based compensation, arguing that stock-option compensation induces excessive risk-taking and risk shifting, often to the detriment of preferred shareholders, bondholders, depositors, and taxpayers. They emphasize the importance of corporate governance mechanisms, such as say-on-pay initiatives, to better align executives' interests with those of shareholders.

Bhagat and Bolton (2014) further examine bank executive compensation in the context of the financial crisis, while Schaeck et al. (2012) analyze the drivers of executive turnover in U.S. banks. Their findings indicate that executives managing banks with higher risk levels or significant losses are more likely to be dismissed. However, these dismissals do not necessarily lead to improved bank performance, suggesting that changes in leadership alone may not address the underlying issues driving poor performance.

In summary, the relationship between executive compensation and risk-taking in the banking sector is complex and influenced by various factors, including deregulation, compensation design, and corporate governance. While some studies highlight the role of stock options and equity-based pay in promoting risk-taking, others suggest that these mechanisms may not have been the primary drivers of poor performance during the financial crisis. The findings underscore the need for balanced compensation structures and robust governance to align executive incentives with long-term bank stability and performance.

5.4 Corporate governance mechanisms and tax avoidance

The relationship between corporate governance and tax avoidance has been a prominent focus of academic research, highlighting the significant influence governance mechanisms have on firms' tax strategies. Effective corporate governance is crucial in steering tax avoidance to an optimal level, balancing the costs and benefits for the firm.

Kovermann and Velte (2019) identify seven key governance aspects that shape tax avoidance: incentive alignment between management and shareholders, board composition, ownership structure, capital market pressure, audit, enforcement and government relations, and stakeholder pressure.

Incentive structures, such as equity-based compensation, often encourage tax avoidance by aligning managerial interests with those of shareholders. However, excessive incentives can lead to over-aggressiveness. Phillips (2003) shows that compensating business-unit managers on an after-tax basis results in lower effective tax rates, while Gaertner (2014) finds that after-tax CEO incentives are positively linked to cash compensation. Armstrong et al. (2012) further explore the role of tax directors, finding a strong negative relationship between their incentives and effective tax rates (ETR), though evidence of their impact on tax sheltering remains inconclusive. Desai and Dharmapala (2006) propose a model suggesting that equity-based compensation aligns managerial incentives with shareholders' goals, promoting tax sheltering, but limits opportunistic behaviors in firms with strong governance.

Board composition and independence also play a role in tax avoidance. Independent and gender-diverse boards are generally associated with reduced tax aggressiveness, though economic conditions and firm-specific contexts can influence these outcomes. Ownership structure further complicates this relationship. Family and government ownership are often linked to lower tax avoidance, while institutional investors may push firms toward more aggressive strategies. For example, Hanlon et al. (2005) find that executive compensation structures, such as bonuses and stock options, correlate with tax aggressiveness and potential audit deficiencies.

External monitoring mechanisms, including audits and capital market scrutiny, tend to deter aggressive tax practices. Stakeholders like employees, unions, and activist groups also influence tax avoidance through public pressure and reputational concerns. Public accountability, such as NGO campaigns or consumer backlash, has been shown to reduce tax aggressiveness in highly visible firms. However,

firms with high product market power or those operating primarily in business-to-business contexts may face fewer reputational risks and, therefore, engage in more aggressive tax planning.

Overall, the interplay between governance mechanisms and stakeholder interests determines the extent and nature of tax avoidance. Balanced governance structures are essential in aligning managerial decisions with broader organizational and societal goals, ensuring that tax avoidance strategies remain within acceptable limits (Hanlon & Heitzman, 2010; Wilde & Wilson, 2018).

5.4.1 Tax avoidance and equity risk incentives in financial institutions

While accounting research on financial institutions has been prolific (for a review, see Beatty & Liao, 2014), there is limited evidence regarding their taxation strategies (Hanlon & Heitzman, 2010). Financial institutions are often excluded from broader tax avoidance analyses due to concerns about regulatory differences. However, the unique characteristics of banks may provide them with specific avenues for engaging in aggressive tax planning. These strategies aim to minimize tax liabilities by exploiting loopholes, engaging in complex planning, or operating in ambiguous areas of tax law. However, such strategies are inherently risky, as they expose firms and managers to regulatory scrutiny, audits, and potential legal challenges. The consequences of failed aggressive tax strategies can be severe, including financial penalties, reputational damage, operational disruptions, and personal liabilities for managers, such as career setbacks or diminished credibility. As a result, while aggressive tax strategies may offer short-term financial gains, they carry significant risks that can undermine organizational stability (Drake et al., 2019) and harm managerial reputations (Gallemore et al., 2014).

Few studies specifically examine banks' tax avoidance and their involvement in profit-shifting behaviors. Gawehn and Müller (2020), Meeks and Meeks (2014), and Schandlbauer (2017) explore these dynamics, while Merz and Overesch (2016) analyze the tax elasticity of subsidiary profits in banks. Their findings reveal that banks exhibit

a tax sensitivity of reported profits more than double that observed in multinational companies outside the financial sector, highlighting banks' enhanced opportunities for tax planning. Langenmayr and Reiter (2022) investigate proprietary trading as a bank-specific method of profit shifting, showing how banks strategically relocate such operations to low-tax jurisdictions.

Additionally, Gallemore et al. (2019) present evidence that banks often act as intermediaries in tax planning. By leveraging their central roles in financial networks, access to private client information, and expertise in structuring and executing transactions, certain banks specialize in facilitating tax planning for corporate clients. This intermediary role underscores the broader influence of financial institutions in shaping corporate tax strategies.

Rego and Wilson (2012) provide insights into the role of executive incentives in driving corporate tax avoidance. Their research focuses on stock option compensation, which increases in value with both stock price (slope effect) and stock return volatility (risk incentive effect). The latter motivates executives to undertake risky projects, including aggressive tax strategies. Their findings demonstrate that equity risk incentives encourage top executives to increase stock return volatility through such strategies. Extending this argument to financial institutions, it can be posited that risk-taking incentives are positively associated with tax avoidance in the banking sector as well. This leads to our hypothesis:

> H1: Bank CEO equity risk incentives are positively associated with tax avoidance.

5.5 Variable measurement and empirical research design

5.5.1 Tax avoidance measurement

Over the past two decades, there has been widespread interest in corporate tax avoidance. Since Shackelford and Shevlin (2001) and Weisbach (2002), researchers have used various measures to answer

their questions on the topic. Previous literature defines tax avoidance as any firm behavior that decreases a firm's explicit tax liability (e.g., Dyreng et al., 2008; Hanlon & Heitzman, 2010; Kubick et al, 2015), spanning a continuum of business transactions from the perfectly legal to the illegal (Weisbach, 2003). Consequently, tax avoidance can potentially capture certain and uncertain tax positions that the tax authority might challenge. In this regard, there is longstanding literature on how accounting methods and reporting choices affect firms' tax planning (Shackelford & Shevlin, 2001; Hanlon & Heitzman, 2010). Other studies show that tax strategies improve accounting outcomes (e.g., Desai & Dharmapala, 2006). Our measure of tax avoidance is the firm's cash effective tax rate, which reflects both temporary or tax deferral differences, and permanent differences and is unaffected by tax accruals. We follow Edwards et al. (2016) and use the annual Cash ETR, computed using cash taxes paid in the numerator divided by pretax income minus special items [TXPD/(PI–SPI)]. Consistent with Dyreng et al. (2008), we constrain our effective tax rate measures so that they fall within the [0,1] interval to ensure a valid economic interpretation related to tax avoidance. Lower values of effective tax rates suggest higher tax avoidance.

However, cash taxes paid over short time periods are an imperfect measure of tax avoidance, as they include payments to (and refunds from) the IRS and other tax authorities related to the resolution of disputes from previous years (Dyreng et al., 2008). When assessed over longer time periods, the income associated with these taxes is more likely to align with the same ratio as the taxes themselves. This highlights the importance of evaluating tax avoidance over extended horizons to obtain a more accurate measure of its effectiveness. Therefore, to capture the outcome of tax avoidance activities over a longer period we measure long-term tax avoidance following (Dyreng et al., 2008) with Cash ETR computer over three years.

5.5.2 Risk taking incentives measurement

Following previous research (Rogers, 2002, 2005; Grant et al., 2009), we measure CEO risk-related incentives as the Vega of CEO's stock

options divided by their Delta. We compute CEO's option Vega as the sensitivity of CEO's option holding to a unit change in stock price volatility by using the first derivative of the Black-Scholes option-pricing model in relation to firm's volatility. When necessary, we follow Core and Guay (2002)'s methodology to retrieve the data for computing options' Vega and Delta. The Vega-to-Delta ratio helps mitigate multicollinearity issues between the sensitivity of a CEO's equity portfolio to stock price and stock volatility, a problem that is especially pronounced in small sample sizes.

In our analysis, we include CEOs' tenure as a control variable. This allows us to account for potential effects related to career concerns that may impact risk-taking behavior. The rationale is that younger managers face greater career concerns compared to their older counterparts, as they need to shape the market's perception of their abilities (Holmström, 1999).

5.5.3 Empirical research design

One common approach to addressing simultaneity and control for the potential endogeneity between the executive compensation structure and firm tax planning decisions is to use lagged endogenous variables in regression analysis (Chi et al., 2017). In our setting, we lag the CEO risk taking incentives and compensation variables by one year and use the lagged values with Ordinary Least Squares (OLS). The argument here is that it is unlikely that current firm tax avoidance activities can affect CEO risk taking incentives received in the previous periods.

To test H1, we estimate the following regression model:

$$Cash\ ETR_{i,t} = \alpha_0 + \alpha_1 Vega\ to\ Delta_{i,t-1} + \alpha_2 Cash\ Compensation_{i,t-1} + \alpha_3 Tenure_{i,t} + \alpha_4 \Sigma\ Firm\ Controls_{it} + \alpha_5 Year\ FE + \varepsilon \qquad Eq\ (1)$$

In line with previous research (Beatty et al., 2002; Fabrizi, 2021), we include as bank level variables the following controls: *Interest ratio* is computed as total interest income over total non-interest income; *Asset risk* is the annualized standard deviation of daily stock price re-

turns times the ratio of the market value of equity and the market value of the bank (Gropp and Heider, 2010); *Dllp* is the discretionary loss loan provisions (Beatty et al., 2002); Size is the natural log of total assets; MVE is the market value of equity; ROA is pre-tax return on assets. *TIER 1* measures the core financial strength from a regulator's point of view and includes core equity and reserves, ensuring financial stability, while *TIER 2* capital comprises subordinated debt and revaluation reserves.

5.6 Data and summary statistics

We focus on financial institutions. Our main sample period covers a period from 1998 to 2019. We construct the sample by first requiring non-missing CEO equity compensation from the Compustat Execucomp database. Financial information is from Bank Regulatory, Crsp-Compustat Bank merged and Crsp-Compustat. Information on pre-tax income is not available for a large sample of financial institutions before 1998. Moreover, data on cash taxes paid (TXPD) is disclosed only from 2004. All variables are defined in Appendix 5.A.

Table 5.1 Descriptive statistics

Variable	N	Mean	S.D.	Q1	Median	Q3
Panel A: Tax avoidance						
Cash ETR	780	0.26	0.18	0.15	0.26	0.34
Cash ETR3	671	0.27	0.19	0.14	0.25	0.33
Panel B: CEO characteristics						
CEO Vega to Delta	780	0.05	0.18	0	0	0.20
CEO Cash Compensation	780	6.78	0.58	6.48	6.77	6.98
CEO Tenure	780	9.15	7.57	3	7	13

Panel C: Bank controls

Interest ratio	780	4.75	4.42	2.02	3.18	5.60
Asset risk	780	0.05	0.02	0.04	0.05	0.06
DLLP	780	0.00	0.00	0.00	0.00	0.01
Size	780	9.71	1.58	8.62	9.29	10.34
MVE	780	7.80	1.54	6.76	7.49	8.45
TIER 1	780	12.09	2.70	10.04	11.68	13.40
TIER 2	780	2.37	1.99	1.25	1.80	2.90
ROA	780	0.02	0.01	0.01	0.01	0.02

This table presents summary statistics for our main variables. Panel A summarizes tax avoidance proxies. Panel B presents statistics on CEO executive compensation. Panel shows firm-level control variables. The variable definitions are presented in Appendix 5.A. All the continuous variables are winsorized at the first and 99th percentiles.

In Table 5.2, we present the Pearson correlation results for the tax avoidance and compensation variables included in our analysis. We do not find a statistically significant correlation between Cash ETR and bank CEO risk-taking incentives.

<div align="center">Table 5.2 - Pearson's correlation matrix</div>

		I.	II.	III	IV.	V.
I.	*Cash ETR*	1.00				
II.	*Cash ETR 3*	0.58***	1.00			
III.	*Vega to Delta*	0.01	0.04	1.00		
IV.	*Cash compensation*	-0.10**	-0.05	0.27***	1.00	
V.	*Tenure*	0.06**	0.06*	-0.05*	0.05*	1.00

This table presents the Pearson's correlation matrix. * indicates significance at the 5% level. All variables are defined in Appendix 5.A.

5.7 Empirical results

Table 5.3 presents results from a lagged specification model to control for the potential endogeneity between the executive compensation structure and firm tax planning decisions. We find a negative association between lagged equity risk incentives and cash effective tax rates, suggesting that equity-risk incentives through option-based compensation enhance bank's tax avoidance behavior, effectively decreasing the share of cash taxes paid over pre-tax income. Moreover, as reported in Column (2), equity-risk incentives are also associated with longer-run corporate tax avoidance.

Table 5.3 – Executive risk - taking incentives and tax avoidance

	(1)	(2)
Dependent variable	Cash ETR	Cash ETR 3
Vega to Delta $_{t-1}$	**-0.114****	**-0.116****
	(0.052)	**(0.057)**
Cash Compensation $_{t-1}$	0.032***	0.029***
	(0.010)	(0.010)
Tenure	-0.000	0.001
	(0.000)	(0.001)
Interest Ratio	0.005**	0.003**
	(0.002)	(0.001)
Asset Risk	-1.609***	-1.505***
	(0.345)	(0.329)
DLLP	-5.034*	-5.082**
	(2.866)	(2.379)
Size	-0.029***	-0.030***
	(0.007)	(0.006)
MVE	0.000	0.000
	(0.000)	(0.000)
TIER 1	0.004	0.001
	(0.003)	(0.003)
TIER 2	0.003	0.002

	(0.003)	(0.002)
ROA	2.099*	2.172*
	(1.189)	(1.184)
Constant	0.322***	0.385***
	(0.099)	(0.097)
Year FE	Yes	Yes
Observations	780	673
R-squared	0.287	0.396

In Columns (1) and (2), we test whether an increase in equity-risk incentives measured by Vega-to-Delta increases firms' tax compliance. This table presents coefficients of a fixed effects model from equation (1) with the tax avoidance measures Cash ETR in Column (1), Cash ETR 3 in Column (2). All variables are described in Appendix 5.A. Standard errors are adjusted for heteroskedasticity and are reported within parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. FE denotes fixed effect. All continuous variables are winsorized at the 1st and 99th percent levels.

5.7.1 Robustness tests

Before the Global Financial Crisis (GFC), intense competition and the pursuit of high profits led banks to take on excessive risks, leaving both the banking sector and the financial system highly vulnerable to shocks (Rajan, 2006). During this time, banks heavily invested in mortgage lending and securitization activities. The promise of high short-term returns from mortgages and securitized products attracted significant investment, with many investors disregarding the associated risks.

The risk-taking behavior of banks has always been a key concern for regulators. The Global Financial Crisis (GFC) reignited discussions about the optimal level of risk that balances bank stability with profitability, exposing significant structural weaknesses in the capital regulations that existed prior to the crisis (Global Financial Development

Report 2019/2020 and references therein). In response to the crisis, numerous preventive measures and regulatory requirements were introduced to address its causes and mitigate the risk of future occurrences, as capital buffers were found to be insufficient to absorb unexpected losses.

The crisis also underscored the importance of considering bank heterogeneity when examining the relationship between bank risk and capital holdings. For example, large financial institutions lacked adequate high-quality capital to withstand losses, ultimately requiring public bailouts (Laeven et al., 2016). However, the performance and behavior of banks in the post-crisis era remain uncertain. Therefore, in Table 5.4 we test whether our previous results (Table 5.3) our particular relevant for the period leading to the GFC or remain statistically significant also in the post period. Table 5.4 shows that the relationship between risk-taking incentives and tax avoidance, while being positive (higher vega-to-delta incentives correspond to lower cash effective tax rate and more tax avoidance), it is statistically significant only in the pre-GFC period, suggesting that the enacted regulation in ex-post period was successful in curbing excessive risk-taking in aggressive tax strategies.

Table 5.4. The role of the Global Financial Crisis

	Pre-GFC	Post-GFC	Pre-GFC	Post-GFC
Depedent variable	*Cash ETR*	*Cash ETR*	*Cash ETR 3*	*Cash ETR 3*
	(1)	(2)	(3)	(4)
Vega to Delta $_{t-1}$	**-0.132****	-2.834	**-0.152****	-1.072
	(0.053)	(1.857)	(0.067)	(2.572)
Cash Compensation $_{t-1}$	-0.012	0.033***	0.067**	0.019**
	(0.030)	(0.011)	(0.033)	(0.008)
Tenure	-0.000	0.001	-0.002	0.001**
	(0.002)	(0.001)	(0.002)	(0.001)
Interest Ratio	0.001	0.007***	0.000	0.003**
	(0.004)	(0.002)	(0.003)	(0.001)

Asset Risk	-0.385	-1.684***	-1.739*	-1.332***
	(0.987)	(0.343)	(1.000)	(0.289)
DLLP	6.622	-6.842**	-3.712	-1.490
	(6.830)	(3.431)	(7.649)	(2.432)
Size	-0.005	-0.032***	-0.039*	-0.028***
	(0.020)	(0.007)	(0.020)	(0.005)
MVE	0.000	0.000*	-0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
TIER 1	0.007	0.004	-0.004	0.001
	(0.008)	(0.003)	(0.011)	(0.002)
TIER 2	0.024**	-0.000	0.015	0.001
	(0.011)	(0.003)	(0.014)	(0.002)
ROA	-5.473***	4.540***	-5.355**	6.293***
	(2.095)	(1.513)	(2.595)	(1.202)
Constant	0.419**	0.099	0.718***	0.232***
	(0.187)	(0.113)	(0.265)	(0.083)
Year FE	Yes	Yes	Yes	Yes
Observations	229	556	195	478
R-squared	0.214	0.261	0.248	0.301

In this table, we test whether increase in equity-risk incentives measured by Vega-to-Delta increases firms' tax compliance before (Columns (1 and 3)) and after the GFC (Columns (2 and 4)). This table presents coefficients of a fixed effects model from equation (1) with the tax avoidance measures Cash ETR in Column (1 and 2), Cash ETR 3 in Column (3 and 4). All variables are described in Appendix 5.A. Standard errors are adjusted for heteroskedasticity and are reported within parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. FE denotes fixed effect. All continuous variables are winsorized at the 1st and 99th percent levels.

Moreover, we perform an additional robustness test, in which we drop bank-year observations that are directly related to the GFC, that is, 2007 and 2008. Table 5.5 shows the results for this restricted sample, where the coefficients are similar to our previous findings in Table 5.3 in terms of statistical significance and magnitude, thus validating the robustness of our main findings.

Table 5.5 Exclusion of GFC firm-year observations.

Dependent variable	Cash ETR	Cash ETR 3
	(1)	(2)
Vega to Delta $_{t-1}$	**-0.104***	**-0.112***
	(0.054)	(0.057)
Cash Compensation $_{t-1}$	0.033**	0.019**
	(0.014)	(0.008)
Tenure	-0.000	0.001*
	(0.000)	(0.001)
Interest Ratio	0.004**	0.004***
	(0.002)	(0.001)
Asset Risk	-1.480***	-1.275***
	(0.311)	(0.292)
DLLP	-7.612***	-3.303
	(2.720)	(2.481)
Size	-0.030***	-0.024***
	(0.007)	(0.006)
MVE	0.000	0.000*
	(0.000)	(0.000)
TIER 1	0.004	-0.001
	(0.003)	(0.002)
TIER 2	0.003	0.001
	(0.003)	(0.002)
ROA	5.047***	4.008***
	(1.087)	(1.249)

Constant	0.142	0.616***
	(0.113)	(0.117)
Year FE	Yes	Yes
Observations	659	597
R-squared	0.293	0.434

In Columns (1) and (2), we test whether an increase in equity-risk incentives measured by Vega-to-Delta increases firms' tax compliance, excluding the years of GCF. This table presents coefficients of a fixed effects model from equation (1) with the tax avoidance measures Cash ETR in Column (1), Cash ETR 3 in Column (2). All variables are described in Appendix 5.A. Standard errors are adjusted for heteroskedasticity and are reported within parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively. FE denotes fixed effect. All continuous variables are winsorized at the 1st and 99th percent levels.

5.7.2 Additional analysis

The accounting treatment for equity-based compensation is governed by Generally Accepted Accounting Standards (GAAP), established by the Financial Accounting Standards Board (FASB) and its predecessor, the Accounting Principles Board (APB). In 1972, APB Opinion 25 required that stock-based compensation be recorded at its intrinsic value (the difference between the stock's market price and the exercise price) on the measurement date, when both the number of shares and exercise price are determined. Between 1995 and 2005, firms followed FAS 123, which encouraged the use of fair value (e.g., Black-Scholes model) to measure compensation cost but allowed firms to use the intrinsic value method for income statements while disclosing fair value in footnotes. In 2004, FASB issued FAS 123R, which mandated fair value accounting for equity-based compensation on income statements, becoming effective for large public firms in mid-2005. This change significantly impacted the accounting treatment of

fixed stock options, where the number of shares and exercise price are known at the grant date. Under APB 25, firms using the intrinsic value method often recorded no compensation expense because the exercise price typically matched the grant-date stock price. However, under FAS 123R, all employee stock options must be accounted for using fair value, resulting in compensation expense recorded on the income statement. The grant's fair value is measured on the grant date and expensed over the vesting period, with adjustments made only for changes in expected vesting percentages.

Other forms of equity-based compensation were less affected by FAS 123R. Restricted stock without performance or market conditions was treated similarly under both intrinsic and fair value methods, with compensation cost equal to the grant-date fair value. Equity awards with performance-based vesting conditions had notable changes. Under APB 25, these awards received variable accounting treatment, with compensation cost remeasured periodically based on intrinsic value. FAS 123R shifted to recognizing compensation expense based on the probable outcome of performance conditions, with adjustments made to reflect actual outcomes. This approach introduced some discretion in recording expenses for performance-based awards but not for fixed options or restricted stock. The tax treatment of equity-based compensation remained unchanged under FAS 123R.

In line with results in Hayes et al. (2012), Table 5.6 shows that equity risk incentives measured by the option vega to delta decrease after the adoption of SFAS 123R. Our dummy variable takes value 1 for years from 2004 onwards, accounting for a possible anticipation effect. This evidence suggests that despite equity risk incentives have a predominant role in the compensation design of bank CEOs, banks appear to decrease option compensation, conforming with the newly prescribed rule on option expensing.

Table 5.6. The role of SFAS 123R

Dependent variable	Vega to Delta

	(1)
Post SFAS 123R	**-0.528*****
	(0.051)
Cash Compensation	0.003
	(0.013)
Tenure	0.000
	(0.000)
Size	0.040*
	(0.024)
MVE	-0.000***
	(0.000)
TIER 1	0.001
	(0.003)
TIER 2	-0.001
	(0.004)
ROA	-1.289***
	(0.449)
Constant	0.146
	(0.261)
FE	YES
Observations	1,395
R-squared	0.807

In this table, we present results of a firm fixed effect regression describing changes in the equity risk incentives in CEO compensation around the adoption of SFAS 123R.

5.8 Conclusion

Understanding risk-taking in the banking sector is essential due to its unique characteristics, including high leverage and government guarantees. These features create an environment where excessive

risk-taking is incentivized, leading to potential moral hazard and systemic risks (Bhagat & Bolton, 2014; Fabrizi, 2021; Fahlenbrach & Stulz, 2011). This chapter has explored the role of executive compensation, particularly equity risk incentives, in shaping risk-taking behavior and corporate tax avoidance strategies in the banking industry. The findings contribute to the broader literature on corporate governance, executive compensation, and financial stability, offering valuable insights for academics, practitioners, and policymakers.

The structure of executive compensation has been a critical area of focus, especially following the Global Financial Crisis, which exposed significant flaws in incentive systems. Compensation packages that prioritize short-term financial performance, often through equity-based incentives such as stock options, have been criticized for encouraging excessive risk-taking (Guo et al., 2015). In the banking sector, this issue is particularly acute due to the sector's high leverage and the implicit and explicit guarantees provided by governments. These factors reduce the natural market constraints on risk-taking, allowing executives to pursue strategies that may benefit shareholders in the short term but pose significant risks to long-term financial stability.

This chapter specifically examines the relationship between CEO equity risk incentives and corporate tax avoidance in the banking industry, an area that has received relatively little attention in the literature. Tax avoidance, while legal, is inherently risky and can expose firms to regulatory scrutiny, reputational damage, and financial penalties. For banks, these risks are magnified by their central role in the financial system and their heightened visibility to regulators and the public. The findings of this chapter reveal a significant association between equity risk incentives and tax avoidance, suggesting that the design of executive compensation packages influences not only risk-taking behavior but also tax planning decisions.

The empirical analysis demonstrates that higher levels of equity risk incentives, as measured by the Vega-to-Delta ratio of CEO stock options, are associated with lower cash effective tax rates (Cash ETR). This relationship indicates that CEOs with greater exposure to equity

risk are more likely to engage in aggressive tax strategies, effectively reducing the share of cash taxes paid relative to pre-tax income. These findings align with prior research that links equity-based compensation to risky corporate behavior, including tax aggressiveness (Desai & Dharmapala, 2006; Hanlon & Heitzman, 2010; Rego & Wilson, 2012).) By focusing on the banking sector, this study adds a new dimension to the literature, highlighting the unique ways in which compensation structures influence managerial decision-making in this highly regulated and leveraged industry.

The results also reveal important temporal dynamics. The association between equity risk incentives and tax avoidance is particularly pronounced in the years leading up to the GFC, a period characterized by deregulation, intense competition, and a focus on short-term profitability. During this time, banks heavily invested in high-risk activities, such as mortgage lending and securitization, which were incentivized by compensation structures that rewarded short-term gains (Fabrizi, 2021). However, the relationship weakens in the post-crisis period, suggesting that regulatory reforms implemented in the aftermath of the GFC were effective in curbing some of the more extreme manifestations of risk-taking behavior. These findings underscore the importance of regulatory oversight in shaping compensation practices and mitigating systemic risks.

In addition to its primary findings, the chapter contributes to the literature on corporate governance by highlighting the interplay between governance mechanisms and tax strategies. Effective governance is crucial for aligning managerial incentives with long-term organizational goals, including financial stability and compliance with tax regulations. The study's findings suggest that poorly designed compensation structures can undermine governance efforts, incentivizing behaviors that prioritize short-term gains over sustainable value creation. This insight has important implications for policymakers and practitioners, who must balance the need for competitive compensation packages with the risks associated with excessive risk-taking and tax aggressiveness.

The chapter also addresses methodological challenges in studying

the relationship between executive compensation and tax avoidance. By using a lagged model to account for potential endogeneity, the analysis provides robust evidence of the causal link between equity risk incentives and tax strategies. The inclusion of control variables, such as CEO tenure and firm-level characteristics, further strengthens the validity of the findings.

The implications of these findings extend beyond the banking sector. While banks have unique characteristics that amplify the impact of compensation structures, the broader principles of incentive alignment and risk management are relevant to other industries as well. The study highlights the need for balanced compensation designs that promote long-term value creation while mitigating the risks associated with aggressive tax planning and other risky behaviors. For regulators, the findings underscore the importance of monitoring compensation practices and ensuring that they align with broader financial stability objectives.

Future research could build on this study by exploring the role of other governance mechanisms in shaping tax strategies and risk-taking behavior. For example, the composition and independence of boards, the influence of institutional investors, and the role of external auditors are all potential areas of investigation. Additionally, research could examine the impact of cultural and institutional differences on the relationship between executive compensation and corporate behavior, providing a more comprehensive understanding of these dynamics in a global context.

In conclusion, this chapter provides a comprehensive analysis of the relationship between CEO equity risk incentives and corporate tax avoidance in the banking industry. By focusing on this unique sector, the study not only fills a critical gap in the literature but also offers valuable insights into the broader dynamics of executive compensation, corporate governance, and financial stability. The findings highlight the dual role of equity-based compensation as both a driver of risk-taking and a tool for aligning managerial incentives with shareholder interests. However, they also underscore the risks associated with poorly designed incentive structures, particularly in highly

leveraged and regulated industries like banking. As banks continue to navigate an increasingly complex regulatory and economic landscape, understanding the drivers of risk-taking and tax planning behavior remains a critical challenge for researchers, practitioners, and policy-makers alike. By addressing these issues, this chapter contributes to the ongoing dialogue on how to create more resilient and sustainable financial institutions, ultimately benefiting the broader economy and society.

Appendix 5.A - Summary of variable definitions

Dependent variables

Cash ETR	The sum of three-year taxes paid (TXPD) ending in year t+2 dividend by the sum of three-year pre-tax minus income from special items (PI-SPI) ending in year t+2.
Cash ETR 3	The three-year cash ETR starting in year t.

Independent variables

CEO vega to delta	The sensitivity of the change in the Black–Scholes option value for a 1% change in stock return volatility (Vega), multiplied by the number of options in the CEO's portfolio divided by 1% × (share price) × (number of shares held) + 1% × (share price) × (option delta) × (number of options held).
CEO cash comp	Salary + Bonus.
CEO tenure	The tenure of the CEO at fiscal year t.

Firm-level variables

Interest ratio	Total interest income over total non-interest income.
Asset risk	Annualized standard deviation of daily stock price returns times the ratio of the market value of equity and the market value of the bank. (Gropp & Heider, 2010).
Dllp	Discretionary loss loan provisions.
TIER 1	Tier 1 capital.
TIER 2	Tier 2 capital.
SIZE	The natural log of the firm total assets (AT).

BtM	Book to market ratio calculated as total common equity (CEQ) divided by the common shares outstanding (CSHO) multiplied by the stock price at fiscal year-end (PRCC F).
MVE	Market value of equity.
ROA	The pre-tax return on assets.

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In an era of global financial complexity, corporate tax avoidance has emerged as one of the most debated issues in modern business practices. This comprehensive work delves deep into the intricate world of corporate tax strategies, offering fresh insights into how companies navigate the delicate balance between legal tax optimization and ethical responsibilities.

Drawing from original empirical research across multiple institutional settings, this book examines the multifaceted nature of tax avoidance through various lenses, from the fundamental framework of tax planning to the crucial roles of corporate governance and executive incentives. The analysis spans critical areas, including tax risk management, capital structure decisions, and the banking sector's unique dynamics of tax avoidance.

The author meticulously unravels the "under-sheltering puzzle," revealing the drivers that might incentivize corporations to forgo tax-saving opportunities despite apparent financial advantages. Through an innovative analysis of executive compensation, inside debt, and risk-taking behavior, the book challenges conventional wisdom about corporate tax decisions.

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