University of Southampton

Faculty of Social Sciences

Department of Accounting, Southampton Business School

Essays on Tax Avoidance

by

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Thesis for the degree of Doctor of Philosophy

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Abstract

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This thesis investigates the determinants of corporate tax avoidance by examining the influence of informal institutional pressures and contextual factors across three interrelated empirical studies. Moving beyond conventional firm-level and governance explanations, it explores how socio-cultural, regulatory, and competitive environments shape tax behaviour among U.S. firms. The first study tests whether localised creative corporate culture—measured by the regional concentration of creative classified occupations—affects long-term tax avoidance. Using a panel of U.S. firms (1990–2022) and county-level data from the ERS creative class index, it applies OLS, 2SLS, and PSM estimations with robustness checks. Grounded in Institutional Theory, the findings reveal that firms in highly creative regions pursue more aggressive tax strategies, particularly under greater tax uncertainty. The second study examines how regulatory fragmentation, captured through a machine-learning-based textual measure of U.S. federal regulations, influences tax avoidance. Based on U.S.-listed firms (1995–2019), and using OLS, 2SLS, and PSM estimations, the results show that fragmentation generally limits aggressive tax planning, with stronger effects under high regulatory intensity—highlighting how institutional complexity and enforcement shape compliance. The third study explores technological peer pressure—proxied by peers' relative R&D intensity—and its effect on tax avoidance using firm-year data from U.S. public companies (1996–2019). The results indicate that firms under greater technological pressure engage in higher tax avoidance in order to reallocate resources toward innovation, a tendency amplified under financial constraint. Collectively, the thesis advances our understanding of corporate tax behaviour by incorporating Institutional Theory, innovation dynamics, and tax policy perspectives. It extends insights for policymakers and scholars on how broader institutional and competitive contexts influence firms' fiscal decisions beyond those from internal financial or governance factors.

Keywords: Tax avoidance, local creative culture, regulatory fragmentation, technological peer pressure, U.S. firms

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Research Thesis: Declaration of Authorship

Print name: Norah Abdullah Mohammed Alduhan

Title of thesis: Essays on Tax Avoidance

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
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Norah Abdullah Mohammed Alduhan

This thesis is lovingly dedicated to my wonderful family, whose presence, love, and support have been the foundation of this journey.

Abbreviations

TA.....Tax Avoidance

LCC .....Local Creative Culture

Reg_Frag .....Regulatory fragmentation

TPP .....Technological Peer Pressure

Chapter 1

Introduction and Background

Chapter 1: Introduction and Background

1.1 Research Background

Corporate tax avoidance has emerged as a central concern in accounting scholarship due to its implications on fiscal policy, firm transparency, and broader societal equity. As multinational enterprises expand and regulatory environments grow increasingly complex, scholars and regulators alike have become more interested in understanding the drivers behind firms' decisions to engage in tax avoidance strategies. While early research often examined tax avoidance through the lens of internal firm characteristics such as financial performance, risk appetite, and governance structures (Desai & Dharmapala, 2009), recent studies have expanded this perspective to encompass the external, institutional, regulatory, and socio-cultural environments that shape corporate tax behaviour in nuanced ways (Atwood et al., 2012; Demirbag et al., 2013).

One important stream of literature considers how institutional environments influence corporate conduct. According to Institutional Theory, firms do not operate in a vacuum; rather, they adapt their strategies in response to pressures and expectations within their institutional surroundings (DiMaggio & Powell, 1983). Research has demonstrated that institutional norms, legal infrastructure, and national culture play a vital role in shaping both financial reporting (Ball et al., 2000) and tax behaviour (Atwood et al., 2012). For example, firms in environments that prioritise compliance and transparency may be less inclined to engage in aggressive tax strategies, whereas environments characterised by weak enforcement or ambiguous tax norms may implicitly encourage such behaviour (Riahi, 2004; Muller & Kolk, 2012).

Complementing this institutional lens is Social Identity Theory, which explores how group affiliations influence firm-level decisions. Firms may identify with regional or industrial subcultures that signal what is perceived as normative or acceptable behaviour. In areas characterised by high levels of creativity and innovation, firms often align their actions with the ethos of their peer communities. Ucar (2019) finds that creative cultures are associated with greater risk-taking, including in financial reporting, while Ucar (2018) demonstrates that such firms tend to have higher innovation outputs. If tax avoidance is perceived as consistent with innovation-driven strategies in such cultures, peer influence may push firms to adopt similar tax positions—whether conservative or aggressive.

A related framework is Behavioral Ethics Theory, which offers an individual-level perspective on ethical decision-making in organisations. This theory emphasises that ethics are shaped not just by rules and incentives but also by social cognition and identity cues drawn from daily interactions with peers (Treviño et al., 2006). Employees and executives working in environments where tax avoidance is normalized may adjust their own ethical boundaries accordingly (Zey-Ferrell et al., 1982; Weaver & Agle, 2002). The frequency of interaction with peers, as well as the symbolic and physical structure of an organisation, can significantly shape how individuals prioritise tax compliance over other strategic goals (Weaver, 2006).

From a regulatory standpoint, fragmentation across tax jurisdictions has added further complexity to corporate decision-making. The Transaction Cost Economics approach posits that firms seek to reduce the compliance costs associated with regulatory divergence (Williamson, 1981). Empirical evidence by Kalmenovitz et al. (2022) supports this notion, showing that firms operating under fragmented regulatory regimes face higher compliance burdens, which may incentivise more aggressive forms of tax planning. On the other hand, such complexity may also act as a mechanism to enhance internal controls and corporate governance, reducing agency conflicts and constraining managerial discretion (Herrera & Gonzalez, 2019; Hoseini et al., 2019).

In particular, the influence of Technological Peer Pressure (TPP) has garnered attention as a potential driver of tax strategies. Recent literature emphasises that in innovation-driven and financially constrained settings, firms may adopt tax avoidance to preserve liquidity for research and development (R&D) investment. Studies show that limited internal financing increases firms' reliance on tax planning as a strategic tool to support innovation (Zhang & Jin, 2021; Howell, 2016). Furthermore, mimetic dynamics within peer groups can reinforce such behaviour, especially when leading firms set aggressive tax norms that others follow to maintain competitive parity (Li et al., 2014). These findings support a quite contemporary view that tax avoidance becomes a functional response to innovation pressure, shaped more by financial necessity than reputational concerns.

Taken together, these perspectives suggest that corporate tax avoidance is not solely a matter of managerial discretion or internal governance, but rather a socially constructed and environmentally conditioned phenomenon. The external environment—shaped by regulatory regimes, institutional norms, cultural context, and peer networks—can exert significant influence over tax strategies. Yet, despite the richness of these theoretical insights, empirical evidence remains fragmented. While some studies examine tax behaviour through the

institutional lens, others focus on firm characteristics, with few studies integrating these external influences within a cohesive analytical framework.

1.2 Research Motivation, Aims, and Research Essays

Understanding corporate tax avoidance has long been a central concern in accounting research due to its profound economic, ethical, and policy implications. While a substantial body of literature has examined the firm-specific and internal governance determinants of tax avoidance (Desai & Dharmapala, 2009), there is growing recognition that external environmental factors—such as institutional, cultural, and competitive pressures—also play a pivotal role in shaping corporate tax behaviour. These external forces often operate subtly yet powerfully, influencing firms' strategic decisions in ways that traditional frameworks fail to capture. Accordingly, this thesis broadens the analytical lens by exploring how informal institutions, regulatory fragmentation, and peer dynamics shape corporate tax avoidance decisions in the United States.

The motivation for this research arises from several key observations. First, the traditional view of tax avoidance as a purely financial or opportunistic act is increasingly challenged by evidence that social norms, specific local culture, and peer benchmarking can significantly alter tax behaviour (Boone et al., 2013; Hasan et al., 2023). These contextual influences—deeply embedded in the local environments where firms operate—can either constrain or reinforce tax minimisation efforts. Second, while regulatory frameworks and enforcement mechanisms are well-established determinants of tax compliance, the phenomenon of regulatory fragmentation—where multiple agencies oversee overlapping domains—remains underexplored, particularly in how it interacts with uncertainty and firm-level constraints. Third, peer pressure in technology-intensive industries, where innovation is both capital-intensive and highly visible, introduces strategic tension: firms must balance conserving cash through tax savings against maintaining legitimacy by adhering to more conservative fiscal norms.

Theoretically, this research is grounded in a pluralistic framework that integrates Institutional Theory, Social Identity Theory, Behavioral Ethics Theory, and Resource Constraints Theory. Collectively, these frameworks suggest that firms are influenced not only by profit-maximisation but also by the norms of their environments, the identities they construct, and the perceived legitimacy of their actions. Institutional Theory posits that organisations are embedded within societal norms and institutional pressures, which lead to isomorphic

behaviours (DiMaggio & Powell, 1983). Social Identity Theory emphasises that peer affiliation and group conformity influence managerial choice (Tajfel & Turner, 1979), particularly within creative and technology-driven industries. Behavioral Ethics Theory provides insight into how informal ethical climates within peer networks shape tolerance toward behaviours such as tax avoidance (Treviño et al., 2006). Finally, Resource Constraints Theory offers a compelling rationale for why firms with innovation pressure and financial limitations may engage in tax avoidance—not as a sign of moral deficiency, but as a strategic mechanism to preserve liquidity and sustain innovation in competitive environments.

Despite the theoretical importance of such factors, empirical investigation into how these external drivers interact with corporate tax strategies remains limited, particularly in a U.S. context. The choice of the United States as the empirical setting is particularly appropriate, as it offers substantial within-country variation in informal institutions—including local culture, social norms, and economic structures—enabling a more granular examination of how these factors shape corporate behaviour (Guiso et al., 2006). Moreover, the complexity of the U.S. federal system, characterised by multiple regulatory bodies and overlapping jurisdictions, makes it especially well-suited to analysing the implications of regulatory fragmentation. This setting is further strengthened by the availability of high-quality, longitudinal firm-level data, allowing for the consistent and reliable measurement of tax behaviour over time (Hanlon & Heitzman, 2010). Examining these dynamics within a single-country context also facilitates the isolation of environmental and institutional effects without the confounding influence of cross-country differences. While this focus may limit direct generalisability, the U.S. nonetheless provides a benchmark setting through which broader insights into corporate tax behaviour in complex institutional environments can be developed.

Studies examining cultural influences on tax behaviour have largely focused on national-level culture (Hanlon & Heitzman, 2010), while the effects of specific local corporate culture such as that of creative industries remain underexplored. Similarly, although regulation is a well-recognised determinant of compliance, the implications of regulatory fragmentation and intensity—especially within the U.S. federal system—require further inquiry. Moreover, while peer influence has been widely documented in innovation and disclosure studies, its impact on fiscal behaviour, particularly in R&D-intensive industries, remains under-theorized.

To address these gaps, this thesis comprises three interrelated empirical studies, each investigating a distinct external dimension influencing firms' tax avoidance decisions:

(i) First Paper: The Impact of Local Creative Culture on Corporate Tax Avoidance

This study examines whether firms headquartered in counties with a high concentration of creative occupations display distinctive tax avoidance behaviour. Drawing on cultural theory and risk-tolerance literature, it explores how local norms surrounding creativity and innovation shape managerial perceptions of legitimacy and risk in tax strategy, and whether these effects differ under financial constraints or strategic uncertainty.

(ii) Second Paper: The Impact of Regulatory Fragmentation on Corporate Tax Avoidance

Focusing on the structure of U.S. regulatory oversight, this paper evaluates how fragmentation across federal agencies affects firms' propensity to engage in tax avoidance. Using a multi-method approach, it examines the interaction between fragmentation, regulatory intensity, and social context, providing new evidence on how institutional complexity influences corporate fiscal behaviour.

(iii) Third Paper: The Impact of Technological Peer Pressure on Corporate Tax Avoidance

This study investigates how peer influence in innovation-intensive industries affects tax planning. Grounded in Resource Constraints Theory, it examines whether firms mimic the tax behaviour of technologically advanced peers as a strategic response to innovation pressure—particularly under conditions of financial constraint—and offers novel insights into how peer benchmarking drives aggressive tax strategies when internal resources are limited.

Together, these studies contribute to the literature by demonstrating how informal institutions, fragmented governance, and competitive pressures jointly shape firms' fiscal behaviour. Collectively, they advance a more nuanced understanding of tax avoidance—one that recognises it as both an economic strategy and a socially embedded response to the external environment.

1.3 Methodology

This thesis is structured as a three-essay empirical investigation into the determinants of corporate tax avoidance, utilising panel data methods to capture both cross-sectional and temporal variation. Each essay addresses a distinct theoretical construct while employing a consistent econometric framework to ensure comparability and coherence across findings. Panel data estimation techniques are applied throughout to control for unobservable firm-level characteristics, time-specific effects, and industry-level heterogeneity.

A consistent measure of corporate tax avoidance is employed across all three essays: the cash effective tax rate (CETR), which is defined as the ratio of cash taxes paid to pre-tax book income, net of special items, following prominent studies such as Armstrong et al. (2012), Hasan et al. (2014), and Kubick et al. (2015). CETR serves as a robust and direct proxy for tax avoidance, as it captures the actual cash remitted to tax authorities rather than accounting-based accrual figures. This measure also incorporates the tax effects of elements such as employee stock options while being less sensitive to managerial discretion in financial reporting (Dyreng et al., 2008).

To mitigate distortions arising from short-term earnings volatility and enhance the stability of estimates, CETR is computed over a rolling five-year horizon, following best practice in prior research (Chen et al., 2010; Hope et al., 2013; Lennox et al., 2013; Lisowsky et al., 2013). Specifically, the measure is calculated by dividing the cumulative cash taxes paid over five years by the cumulative pre-tax book income, net of special items, for the same period. To improve interpretability and address potential skewness, CETR values are winsorized within the [0,1] interval, where lower CETR values denote higher levels of tax avoidance.

Paper 1 – Local Creative Culture and Tax Avoidance

The first paper examines the impact of local creative corporate culture, proxied by the Creative Share (CSHARE) variable, on corporate tax avoidance. CSHARE represents the proportion of the creative workforce within a county and is obtained from the U.S. Economic Research Service (ERS). The analysis is based on a panel of U.S.-listed firms spanning 1990 to 2022, with financial and firm-level data sourced from Compustat. Consistent with prior studies, firms in the highly regulated utilities and financial sectors are excluded, and observations with missing data are removed, resulting in a final sample of 33,011 firm-year observations. Additional models further test whether the relationship between such creative culture and tax avoidance is conditioned by tax uncertainty, following Hanlon et al. (2017).

Paper 2 – Regulatory Fragmentation and Tax Avoidance

The second paper investigates the effect of regulatory fragmentation—defined as the degree of dispersion in regulatory oversight—on corporate tax avoidance behaviour. Regulatory fragmentation is quantified using a machine-learning-based measure developed by Kalmenovitz et al. (2022), which captures the number of regulatory agencies overseeing a single issue, relative to a firm's 10-K disclosure content. The analysis is conducted on a panel of U.S.-listed firms from 1995 to 2019, resulting in 32,348 firm-year observations after applying standard exclusion criteria. Tax avoidance is measured using the five-year cash

effective tax rate (CETR), consistent with Paper 1. Control variables and lag structures are also aligned with the first study to ensure comparability. In addition, the paper explores the moderating role of regulatory intensity, examining whether stronger enforcement amplifies the relationship between fragmentation and tax avoidance.

Paper 3 – Technological Peer Pressure and Tax Avoidance

The third paper examines whether technological peer pressure (TPP)—measured as the R&D intensity of technologically similar firms—affects corporate tax avoidance. The TPP construct is developed following Cao et al. (2018) and is derived using cosine similarity based on firms' product market structures and R&D investment patterns. The dataset covers U.S. publicly listed firms from 1996 to 2019, comprising 18,985 firm-year observations. Tax avoidance is again measured using the five-year cash effective tax rate (CETR), consistent with the previous essays. The analysis further investigates whether financial constraints moderate the relationship between technological peer pressure and tax avoidance. As in related studies, the models include standard firm-level controls, year and industry fixed effects, and lagged independent variables, to mitigate endogeneity concerns and enhance causal inference.

1.4 Overview of Empirical Essays

This section outlines the thesis structure, namely three independent yet thematically connected empirical studies. For each paper, it provides a concise overview of the core research aims and questions, the nature of the dataset and sample used, and the anticipated findings, as well as theoretical and practical contributions.

First Paper: Local Creative Culture and Tax Avoidance

This paper conducts an empirical examination of the relationship between local creative culture and corporate tax avoidance within the U.S. context. The primary objective is to determine whether the presence and intensity of the creative class within a firm's local environment—measured by Creative Share (CSHARE)—significantly influence its long-term tax planning behaviour, as captured by the five-year cash effective tax rate (CETR). Grounded in the theoretical premise that socio-cultural environments shape managerial decision-making, the study explores how regional concentrations of creative occupations—such as those in the arts, media, engineering, design, and technology—affect a firm's ethical climate and tax strategy choices. Furthermore, the paper investigates whether tax uncertainty moderates this

relationship, providing deeper insight into how local culture interacts with fiscal decision-making under varying levels of ambiguity and risk.

Data and Sample: The study employs a large panel dataset of U.S. firms spanning 1990 to 2022. The dependent variable, CETR, is obtained from the Compustat database and calculated as the ratio of cash taxes paid to pre-tax book income, net of special items—winsorized and truncated to the [0,1] range to mitigate outlier influence (Dyreng et al., 2008; Hasan et al., 2014; Hope et al., 2013). The main explanatory variable, CSHARE, is sourced from the U.S. Department of Agriculture's Economic Research Service (ERS), which provides county-level data on the proportion of the workforce employed in occupations requiring high levels of creativity and problem-solving (Leuenberger & Kluver, 2006). Linear interpolation is applied to fill missing data between 1990, 2000, and 2007, following Ucar (2018; 2019). The final sample excludes regulated utilities and financial institutions and removes observations with missing key variables, resulting in a balanced panel of 33,011 firm-year observations across more than 8,700 unique firms.

Hypothesized Results: It is hypothesized that higher levels of local creative culture are positively associated with corporate tax avoidance, implying that firms in more creatively dynamic regions may adopt more aggressive tax strategies, reflected in lower CETR values. Furthermore, it is expected that tax uncertainty will moderate this relationship by defining the boundary conditions under which creative cultural norms influence tax behaviour.

Anticipated Contributions: This paper provides novel empirical evidence on how informal local institutions, represented by creative human capital, shape corporate fiscal behaviour. While prior research has largely emphasised formal governance mechanisms, this study extends the literature by incorporating socio-cultural determinants of tax avoidance. Moreover, by examining the moderating role of tax uncertainty (Hanlon et al., 2017), the study offers a more nuanced theoretical framework for understanding heterogeneity in firms' tax planning decisions. The findings are expected to enrich ongoing debates on ethics and innovation in financial decision-making and expand the conceptual boundaries through which corporate tax avoidance is analysed in accounting and institutional research.

Second Paper: Regulatory Fragmentation and Corporate Tax Avoidance

This paper conducts an empirical investigation into the impact of regulatory fragmentation on corporate tax avoidance among U.S. firms. The primary objective is to examine whether the dispersion of regulatory authority—measured by the number of agencies involved in governing a specific issue—affects firms' tax planning behaviour. The central question is whether greater

regulatory complexity leads firms to engage in more aggressive tax avoidance strategies, as proxied by the five-year CETR. Building on the premise that fragmented regulatory systems may create ambiguity, enforcement gaps, and opportunities for regulatory arbitrage, this study explores how firms strategically respond to such institutional complexity. Furthermore, the analysis introduces regulatory intensity as a moderating mechanism to assess whether the strength and depth of enforcement affect the relationship between fragmentation and tax avoidance.

Data and Sample: The study employs a panel dataset of U.S. publicly listed firms spanning 1995 to 2019, with financial and tax-related information sourced from Compustat. The dependent variable, CETR, is computed following Dyreng et al. (2008), Hasan et al. (2014), and Hope et al. (2013) as the ratio of cash taxes paid to pre-tax book income net of special items, winsorized and truncated to the [0,1] range to preserve economic interpretability. The key explanatory variable, regulatory fragmentation (Reg_Frag), is drawn from the machine-learning-based index developed by Kalmenovitz et al. (2022), which quantifies the number of distinct federal agencies regulating a given firm-specific topic, based on 10-K filings and Federal Register data. To ensure reliability, firms in regulated utilities (SIC 4900–4999) and financial institutions (SIC 6000–6999) are excluded. After applying data filters and removing incomplete observations, the final sample comprises 32,348 firm-year observations.

Hypothesized Results: It is hypothesized that regulatory fragmentation generally constrains corporate tax avoidance by increasing compliance complexity and oversight costs. However, this relationship is contingent on regulatory intensity. Under high-intensity environments, fragmentation amplifies compliance pressure, reinforcing deterrence and limiting aggressive tax planning. Conversely, in low-intensity regimes, the constraining effect weakens, as firms exploit jurisdictional ambiguities to optimise tax outcomes. Thus, the relationship between fragmentation and tax avoidance is context-dependent, reflecting the interplay between institutional design and enforcement strength.

Anticipated Contributions: This paper makes several contributions to the literature. First, it introduces regulatory fragmentation as a novel institutional determinant of tax avoidance, extending beyond firm-level or governance-based explanations. Second, it challenges the traditional assumption that regulation functions as a cohesive system by demonstrating that the dispersion of authority itself influences corporate compliance behaviour. Third, by integrating regulatory intensity as a moderating variable (Kalodimos, 2025), the study provides a more nuanced understanding of how enforcement strength interacts with regulatory complexity to shape tax planning outcomes. From a broader perspective, the findings enrich both policy

discourse on regulatory coherence and academic debates on institutional complexity, offering new insights into the mechanisms through which fragmented oversight structures affect firms' fiscal behaviour and compliance strategies.

Third Paper: Technological Peer Pressure and Corporate Tax Avoidance

This paper investigates the relationship between Technological Peer Pressure (TPP) and corporate tax avoidance among publicly listed U.S. firms. The central objective is to assess whether exposure to technologically advanced competitors—measured through peer-relative R&D intensity—influences firms' long-term tax planning behaviour. Drawing on Institutional Theory and Resource Dependence Theory (Pfeffer & Salancik, 1978), the study posits that firms operating in highly innovation-driven environments may intensify their reliance on aggressive tax avoidance as both a mimetic and resource-preserving response to TPP. In such settings, tax savings serve as a strategic mechanism to sustain innovation and remain competitive under external institutional pressures. The study further examines whether this relationship is moderated by financial constraints, which may amplify or weaken the effect of TPP on corporate tax behaviour.

Data and Sample: The empirical analysis employs a panel dataset of U.S.-listed firms spanning 1996 to 2019, with financial and tax-related data obtained from Compustat. The dependent variable, CETR, is calculated following Dyreng et al. (2008), Hasan et al. (2014), and Hope et al. (2013) as the ratio of cash taxes paid to pre-tax book income minus special items, averaged over five years. CETR values are winsorized and truncated to the [0,1] range to mitigate the influence of outliers and ensure interpretability. The key explanatory variable, TPP, follows Cao et al. (2018) and is defined as the logarithm of the ratio between the weighted R&D stock of peer firms—determined through cosine similarity in product market distribution (four-digit SIC)—and the firm's own R&D stock. Consistent with prior research, firms in heavily regulated utilities (SIC 4900–4999) and financial institutions (SIC 6000–6999) are excluded, and observations with missing data are removed. The final balanced panel consists of 18,985 firm-year observations.

Hypothesized Results: It is hypothesized that technological peer pressure significantly influences corporate tax avoidance. Specifically, firms exposed to higher TPP are expected to engage in more aggressive tax planning, reflected in lower CETR values, as they seek to preserve internal liquidity to support innovation investment. However, this relationship is expected to vary with financial constraints, which moderate firms' responses to peer-induced innovation pressure. Firms with limited access to external capital may rely more heavily on tax

savings to fund R&D, whereas less constrained firms may prioritise transparency and reputational considerations, leading to reduced tax aggressiveness.

Anticipated Contributions: This study makes a novel contribution by introducing technological peer pressure as a determinant of corporate tax behaviour—an aspect largely overlooked in the prior tax and innovation literature. Unlike traditional studies centred on governance or institutional regulation, this paper highlights the competitive innovation dynamics that shape firms' fiscal strategies. By leveraging a firm-specific and dynamic TPP measure (Cao et al., 2018), the analysis captures the spillover effects of technological competition on corporate tax planning. Furthermore, by incorporating financial constraints as a moderating factor (Whited & Wu, 2006; Hadlock & Pierce, 2010), the paper provides a nuanced theoretical account of how firms balance resource scarcity and institutional conformity in innovation-intensive settings. Collectively, the findings offer valuable implications for corporate strategy and fiscal policy, underscoring the need for policymakers to consider competitive and resource-based dynamics when designing tax compliance frameworks in technology-driven industries.

1.5 Thesis Outline

This thesis comprises five chapters, including three independent empirical studies (Chapters 2 to 4), alongside an introduction (Chapter 1) and a conclusion (Chapter 5).

Chapter 1 introduces the research background, outlines the motivation, objectives, and methodology, and provides a summary of the main questions, data, and expected contributions of the three studies. Chapter 2 investigates the impact of local creative culture on corporate tax avoidance in the U.S., considering the moderating roles of tax uncertainty.

Chapter 3 explores how regulatory fragmentation affects tax avoidance, using a novel measure of regulatory complexity, and examines the moderating roles of regulatory intensity.

Chapter 4 examines the influence of technological peer pressure on tax behaviour, analysing how innovation-driven environments shape firms' long-term tax strategies, with attention to financial constraint.

Chapter 5 concludes the thesis, summarizing key findings, highlighting theoretical and practical contributions, and suggesting directions for future research.

Chapter 2

Local Creative Culture and Corporate Tax Avoidance

Chapter 2: Local Creative Culture and Corporate Tax Avoidance

Abstract

The purpose of this paper is to examine the relationship between the degree of creativity in local culture and corporate tax avoidance. Using a large, unbalanced panel dataset comprising 33,011 firm-year observations of U.S.-listed companies from 1990 to 2022, the study finds that those headquartered in highly creative regions engage in more tax avoidance practices than those located in areas with lower levels of creative culture. The results further reveal that the impact of creative culture on corporate tax avoidance becomes stronger under heightened tax uncertainty. Cross-sectional analyses confirm that tax uncertainty moderates the positive association between creative culture and tax avoidance, amplifying firms' propensity for aggressive tax behaviour. The positive link between local creative culture and tax avoidance remains robust after controlling for potential endogeneity and across alternative model specifications. Overall, the study contributes to the growing literature on informal institutional influences by demonstrating that companies in more creative local environments are more likely to engage in tax avoidance, highlighting the role of socio-cultural context in shaping corporate financial behaviour.

Keywords: Tax avoidance, local culture, creative culture, local creative culture, corporate tax avoidance, corporate culture, tax strategies

2.1 Introduction

In this study, we examine whether creative culture at the county level in the United States is systematically related to the tax avoidance practices of local corporations headquartered within those counties. Furthermore, we seek to determine whether disparities exist in the extent to which local creative culture influences tax practices among firms facing different financial circumstances, particularly those experiencing uncertainty and financial constraints. To demonstrate the significance and relevance of this research, several arguments are advanced.

The influence of local creative culture on firms' tax-avoiding behaviour can be understood through the lens of prevailing norms and values. Creative cultures, characterised by an emphasis on innovation and unconventional problem-solving, provide an environment conducive to novel thinking and experimentation (Wang et al., 2010). Such environments may foster perceptions of tax avoidance as a creative and strategic means of optimising profits and resource allocation. Cameron et al. (2014) emphasise that firms adopting a creation-oriented approach are typically R&D-intensive. As research and development activities can be employed as an earnings management strategy (Roychowdhury, 2006), corporations may utilise this approach to minimise their tax burden. Consequently, firms headquartered in regions with more pronounced creative culture may be more inclined to explore and implement tax avoidance strategies, perceiving such practices as expressions of creative thinking consistent with the local cultural ethos. This cultural alignment may, in turn, lead to greater acceptance and adoption of tax avoidance practices among firms within such environments.

Examining the incentives that drive firms to engage in tax avoidance reveals substantial pressures to meet investor expectations. Investors frequently seek enhanced returns and may reward firms that manage their tax liabilities effectively, thereby improving profitability. Firms operating in more creative cultural contexts are said to often leverage their innovative capabilities to develop sophisticated tax planning strategies that boost financial performance and investor confidence. Empirical evidence supports this notion, as investors tend to value tax avoidance for its contribution to higher after-tax income. Cook et al. (2017) find that firms exhibiting lower levels of tax avoidance experience reduced capital costs, so tax savings contribute positively to firm value. Consequently, firms within creative environments may engage in tax avoidance to align with investor expectations for superior returns. These firms,

recognised for their creativity and innovation, are also perceived as more adept at navigating complex tax regulations, thereby reassuring investors of the sustainability of their strategies.

Another mechanism through which local creative culture influences firms' tax-avoiding behaviour is its emphasis on risk-taking and adaptability. Creative cultures typically nurture a higher tolerance for risk and ambiguity—traits that resonate with tax avoidance strategies, which often require navigating intricate legal and financial systems. The extant literature highlights a robust connection between creativity and risk-taking propensity (Sitkin & Pablo, 1992; Tesluk et al., 1997; West, 1999; Dewett, 2004, 2006, 2007; Marade et al., 2007; Belbaly & Somsing, 2014; Shalley et al., 2017; Zhou & George, 2001). Creative individuals are frequently more willing to take risks (Amabile, 1983; Dewett, 2006; Heilman, 2016) and Zhou and George (2001) suggest that creativity entails "a departure from the status quo". Creative performance is thus influenced by a willingness to take risks (West & Sacramento, 2012; Shin & Eom, 2014; Isaksen et al., 1999). This lean is among the most salient characteristics of creative individuals (Amabile, 1983; Dewett, 2006; Heilman, 2016). According to Ucar (2019), companies located in regions with strong creative cultures are more likely to undertake greater risks and engage in real earnings management. In the face of uncertain economic conditions and evolving government regulations, firms headquartered in areas with a pronounced creative culture may indeed be more inclined to adopt tax avoidance as an adaptive response aimed at safeguarding and enhancing their financial position. The cultural endorsement of risk-taking fosters an entrepreneurial spirit in which tax avoidance is viewed as a calculated risk designed to achieve competitive advantage and maintain financial flexibility. As a result, firms embedded within settings with creative culture may demonstrate a stronger propensity to engage in tax avoidance practices.

How we view tax avoidance within the framework of local creative culture is also shaped by the notion of perceived legitimacy. In creative cultures, actions that challenge conventional practices are often viewed with admiration and respect. For instance, Luscombe (2004) highlights that highly esteemed tax experts have earned recognition due to their meticulous examination of complex tax code provisions, careful consideration of their implications, and ingenuity in crafting transactions that exploit statutory language in innovative ways. Their expertise enables clients to benefit from creative thinking in tax matters. When conducted within legal boundaries, tax avoidance may be regarded as an acceptable and innovative method by which firms strategically navigate the complexities of conventional tax systems. Thus, in

creative cultures, tax avoidance may not be perceived negatively, as it aligns with the prevailing norm of embracing novel and unconventional approaches.

Viewed another way, the theoretical definition of creative culture emphasises value-adding innovation (Quinn & Rohrbaugh, 1983; Cameron et al., 2014); yet, engaging in earnings management—which undermines financial reporting quality—can be costly, as it requires effort (Zang, 2012) and diverts managerial attention away from value-creating projects (Goldman & Slezak, 2006). Fiordelisi et al. (2019) conclude that creative firms generate higher innovative output. They argue that a creative corporate culture enhances firm value and that creativity exerts a positive influence on a company's capacity to produce valuable innovation. From an economic perspective, innovation stimulates growth through the introduction of new products, novel production methods, and the establishment of new markets or supply chains (Aghion et al., 2013). According to Johansson et al. (2008), a firm's tax behaviour is also influenced by the level of economic development within its country of operation.

From another standpoint, Dunbar and Phillips (2001) classify companies as either defenders or prospectors. In their framework, prospectors are firms that pursue new products and markets, prioritising experimentation and innovation over cost minimisation. Prior literature has also noted that the reasons firms exhibit differing degrees of tax avoidance are not fully understood. Industry-specific differences in business strategy may account for these variations. Accordingly, if tax avoidance is linked to strategic orientation, this relationship under discussion could clarify disparities in tax avoidance activities observed across industries (Koester et al., 2017). Firms that concentrate on developing and refining new ideas—classified as prospectors—are therefore likely to pay higher taxes. Consequently, local creative culture may exert a positive influence by reducing corporate tax avoidance, as it encourages firms to focus on innovation, value creation, and broader economic advancement.

This study contributes to the theoretical understanding of tax avoidance and its underlying drivers by examining the intricate interaction between local cultural factors and firms' economic characteristics. It extends prior scholarly work in this field. For example, Boone et al. (2013) suggest that religiosity may negatively influence tax avoidance due to its role in fulfilling social expectations. Building on the methodologies of Boone et al. (2013) and Hasan et al. (2017), this study concurs that firms headquartered in states with higher levels of social capital engage in fewer tax avoidance activities than their counterparts.

Meanwhile, understanding the influence of local creative culture on tax avoidance carries similarly important practical implications. More recently, Hasan et al. investigated the extent to which firm-level creativity affects tax avoidance behaviour, revealing a positive association between creativity and tax avoidance (2023). However, this study did not specifically examine the potential impact of a local creative culture setting on tax avoidance and whether the observed relationship was primarily driven by this broader cultural environment rather than the firms' internal corporate culture. Accordingly, a significant gap remains in the literature concerning the role of local creative culture in shaping tax avoidance behaviour. This underscores the need for further empirical investigation to disentangle the complex interplay between local cultural dynamics, corporate culture, and tax avoidance practices.

The above findings were impetus to examine the effect of local creative culture on firms' tax avoidance. In doing so, we address an underexplored question in the tax avoidance literature: the role of local creative culture in explaining substantial variations in firms' tax payments. Importantly, our investigation intersects with corporate tax avoidance strategies, particularly in contexts characterised by uncertainty and financial constraint faced by firms.

In this study, we investigate the association between creative culture and tax avoidance. Our tax avoidance proxies comprise two commonly used measures: the cash effective tax rate (CETR) and the generally accepted accounting principles (GAAP) effective tax rate (ETR). These indicators are widely adopted in the literature (e.g., Dyreng et al., 2010; Hasan et al., 2014). Both GAAP ETR and CETR are employed as long-run measures of tax avoidance to mitigate the effects of significant year-to-year variations (Dyreng et al., 2008; Chen et al., 2010; Hope et al., 2013; Lennox et al., 2013; Lisowsky et al., 2013).

Throughout this analysis, we build on the insights of Hasan et al. (2023), who examined 10-K filings to identify creative corporate cultures. While their approach is innovative, it may overlook the nuanced nature of a firm's genuine creative essence. We measure localised creative culture using the local workforce proportions in creative classifications (CSHARE), following Leuenberger and Kluver (2006). This metric, obtained from the Economic Research Service (ERS), provides a granular representation of creative culture at the county level, given their systematic classification of occupations in the arts, engineering, entertainment, sports, media, and business operations, among others, that demand a high degree of creative thinking. Accordingly, our measure reflects the creative landscape of firms in a tangible manner, given

the prevalence of such professions within each locality. We argue that prior research findings may have been biased due to the exclusion of localised variables such as these in our analysis.

While our study primarily posits that a creative corporate culture promotes tax avoidance by encouraging firms to identify innovative loopholes and justify self-serving behaviours, it is equally plausible that creative culture may constrain tax avoidance. Creative firms frequently prioritise ethical standards, long-term strategic objectives, and stakeholder interests, which can foster more conservative tax strategies. This potential incongruity underscores any investigation into the complex influence of creative culture on corporate tax behaviour.

This research contributes significantly to the literature in several respects. By examining the association between local creative culture and tax avoidance, we enrich the emerging body of work exploring how informal institutions shape accounting outcomes. We investigate this relationship through a comprehensive data collection process and employ regression analysis to identify a significant and positive association between indicators of creative culture and firms' tax avoidance behaviours, suggesting that creative cultures do influence corporate tax planning decisions. This relationship interacts with the effects of corporate creative culture, as evidenced by R&D expenditure and patent-related metrics, which have been well documented in prior academic studies.

This evidence is particularly relevant, as social norms often act as substitutes for formal legal rules by influencing cooperation and commitment (Boytsun et al., 2011). Interestingly, we also observe distinct patterns in tax avoidance among firms headquartered in creative regions that experience uncertainty and financial constraints, suggesting a nuanced and context-dependent dynamic. The findings therefore advance our understanding of the role of creative culture in shaping corporate tax strategies and provide valuable insights for both scholars and policymakers in the field of taxation.

To the best of our knowledge, this is the first study to investigate the direct relationship between local creative culture and corporate tax avoidance. Furthermore, our results complement the recent proliferation of studies examining how variations in socio-economic factors, such as social capital, affect managerial decision-making and organisational practices. The relationship between local creative culture and tax avoidance thus represents a critical area of inquiry, given its far-reaching economic, social, legal, and reputational implications.

This paper is organised into five main sections to investigate the influence of local creative culture on corporate tax avoidance. The first provides a review of the existing literature on local creative culture and its impact on tax avoidance. The second outlines the research methodology, detailing the data collection process, sample selection, and analytical techniques employed. In the third section, we present the empirical findings, discussing the relationships between local creative culture and tax avoidance, as well as the moderating effect of uncertainty and financial constraint in this relation. In the fourth section, we extensively test for endogeneity to help bolster the overall robustness of our research and reinforce the credibility of our conclusions. In the fifth and final section, we present further analyses that provide deeper insights into the research questions. Through this structured decomposition, the paper endeavours to offer an analysis of the impact that local creative culture plays on corporate tax avoidance and the extent of the impact of uncertainty and financial constraints on this relationship.

2.2 Literature / Hypotheses Development

2.2.1 Corporate Culture and Local Culture

A firm's decision-making processes and strategic choices are profoundly influenced by the cultural context in which it operates. According to Ucar (2016), firms owned by local investors tend to align their corporate policies with the prevailing local culture. For instance, Desai and Dharmapala (2006) find that firms located in regions characterised by more collectivist cultural norms are less likely to engage in tax avoidance. In collectivist societies, the emphasis on team harmony and societal welfare translates into higher levels of tax compliance and stronger social responsibility. The local culture of a firm shapes its internal policies, ensuring alignment with the values, norms, and expectations of the surrounding community. Similarly, Wei et al. (2019) emphasise the importance of regional culture and cross-cultural communication in fostering corporate innovation.

Moreover, Ma and Kang (2020) demonstrate the interconnectedness between corporate and social cultures. To compete effectively in new cultural environments, organisations must adapt their strategies when entering foreign markets. Since cultural norms influence organisational performance both directly and indirectly, it is essential for firms to understand and incorporate local social norms. By recognising and embedding these, they can create a more harmonious

work environment alignds with local expectations and values, thereby enhancing overall performance and productivity.

Gao et al. (2011) suggest that non-economic factors, such as local culture and social interactions among corporate executives, exert a considerable influence on firms' financial policies. Similarly, Wilkins and Ouchi (1983) argue that the characteristics of an organisation's specific culture significantly affect its effectiveness.

Hilary and Hui (2009) further demonstrate that local culture exerts a substantial influence on firm behaviour, with findings indicating that higher levels of religiosity within a region are associated with lower levels of risk exposure. This relationship between individual religiosity and risk aversion extends to organisational behaviour, as firms located in more religious counties tend to display lower investment rates and slower growth. Such a condition also shapes executive mobility: chief executive officers are more likely to join firms operating in regions with religious environments similar to those of their previous employers. Indeed, social trust and religious belief are widely reported to play a critical role in shaping individual behaviour (Du et al., 2014; Hasan et al., 2017; Xia et al., 2017; Qiu et al., 2020). For example, Boone et al. (2013) propose that tax avoidance behaviour may be influenced by religiosity, as religious beliefs help individuals adhere to social norms. Their research found that firms located in U.S. counties with strong religious traditions tend to engage in lower levels of tax avoidance.

Furthermore, tax avoidance is found to be affected by a range of cultural factors, including gender diversity, educational attainment, and political orientation (Abernathy et al., 2016; Law & Mills, 2017). Collectively, the aforesaid studies illustrate the profound influence of local culture on corporate policymaking, innovation, financial decision-making, and organisational performance.

2.2.2 Local Creative Culture

The term social norms refers to "common standards within a social group regarding socially acceptable or appropriate behaviour, the breach of which has social consequences. The strength of these norms varies from loose expectations to unwritten rules [with norms being] internalised in socialisation" (Chandler & Munday, 2011, p. 178). Clearly, cultures and therein norms within a locality will influence individual beliefs as people interact in both formal and informal settings, with repeated social interactions generating wider spillover.

According to Florida (2002), the concept of the creative class is fundamental to driving economic growth in urban development. The creative class consists of individuals with high levels of creativity who generate new ideas and knowledge (Florida, 2002; McGranahan et al., 2011). Previous research suggests that this class fosters environments conducive to innovation and economic growth within local communities (Florida, 2002; McGranahan & Wojan, 2007). Leuenberger and Kluver (2006) clarify how the creative class largely shapes creative culture, noting that communities characterised by creativity can produce innovative solutions.

Pitta et al. (2008) and Ucar (2018) further suggest that regions with a high concentration of such creative individuals, or with substantial proportions of linked creative occupations, can be categorised as creative communities. Hence, the proportion of individuals in the local creative class serves as an effective proxy for local creative culture in corporate contexts.

Firms operating in counties with highly creative populations tend to employ a greater share of creative individuals across organisational levels. Consequently, "managerial style, corporate culture, [and] employees' preferences [will be] generally aligned with the local environment of the firm" (Hilary & Hui, 2009). Thus, a company's culture is shaped by its local environment—in this case, the local creative culture.

According to O'Reilly and Chatman (1996), corporate culture refers to "a system of shared values (that define what is important) and norms that define appropriate attitudes and behaviours for organisational members (how to feel and behave)". While deeply ingrained national cultural values are relatively stable, corporate culture can be influenced by major business events (Weber et al., 1996; Guiso et al., 2015; Graham et al., 2017; Grennan, 2019). Consequently, managerial behaviour may be shaped by the firm's immediate socio-economic environment and by interactions among individuals within that environment. Moreover, corporate culture plays a crucial role in organisational decision-making, as employees inevitably face situations that cannot be fully governed by formal regulations (O'Reilly, 1989; Kreps, 1990). For example, firms located in counties with highly creative cultures tend to pay lower dividends (Ucar & Staer, 2018) and engage in more innovative activities (Ucar, 2018). Ucar (2018) also provides evidence that these firms exhibit a greater appetite for risk-taking, engage more frequently in real earnings management, which is more prevalent among firms situated in counties with higher concentrations of creative culture.

Creativity, or the pursuit of novelty, is inherent to human nature (Ryan & Deci, 2000). Scholars have developed a range of definitions of creativity over time (Krmpylis & Valtanen, 2010). For

instance, creativity has been characterised as an effective surprise (Bruner, 2011) or as an "Aha" moment (Kneller, 1965). It has also been conceptualised in terms of divergence (Sethi et al., 2001), the generation of creative ideas (Anderson et al., 2014; Rank et al., 2004), relevance (Ang et al., 2007), and significance to relevant stakeholders (Sasser & Koslow, 2013). It manifests in the evolution of the design of everyday goods and services, such as automobiles, fashion, and technology (Deci, 2000; Simonton, 2000). It generates original and valuable ideas (Amabile, 1983) and is particularly essential for firms seeking to address challenges related to rising competition, discerning consumers, and uncertain environments (Das et al., 2023). Despite the diversity of definitions, two key elements consistently emerge: novelty and value.

Assessments of creativity are inherently subjective, as they depend on the perceptions of observers (El-Murad & West, 2004). It is therefore important to distinguish creativity from the closely related concept of innovation, in defining it precisely. According to Anderson et al. (2014), creativity and innovation are distinct concepts, yet creativity constitutes a necessary precondition for innovation (Amabile, 1996). In other words, creativity is the generation of new ideas, while innovation is implementing those ideas (Rank et al., 2004; Anderson et al., 2014). Clearly, fostering creativity within organisations is essential for stimulating innovation and maintaining competitiveness in dynamic markets.

2.2.3 Local Creative Culture and Tax Avoidance

Recent studies have demonstrated that local creative culture plays a significant role in shaping corporate policies and practices. Ucar and Staer (2018) find that firms located in areas with a stronger creative culture are less likely to be dividend payers and tend to have lower dividend yields. This aligns with the notion that creative culture is associated with higher degrees of risk-taking behaviour (Amabile, 1983; Tesluk et al., 1997; Dewett, 2004, 2006; Heilman, 2016). Creativity and creative thinking inherently require a willingness to take risks, as evidenced by previous studies (Fidler & Johnson, 1984; Tesluk et al., 1997; Shalley et al., 2017; Zhou & George, 2001).

This creative class framework focuses on individuals employed in knowledge-intensive industries and occupations, emphasising their innovative culture and contributions to economic growth. The local creative share, which measures the proportion of the creative class within a region, serves as an indicator of local creative culture (Florida, 2002; Tufts, 2003). Accordingly, Ucar (2018) further explores the relationship between creative culture and corporate innovation

by examining the impact of local creative culture—measured by this local creative share—on the innovation output of a large sample of U.S. firms. The empirical findings reveal that firms located in areas with strong creative cultures, as proxied by local creative share, exhibit a higher number of patents and patent citations. These results offer valuable insights into the influence of local creative culture on corporate innovation, highlighting its significant and positive effect on firms' innovative performance. Ucar (2019) extends this work again, returning to risk. He demonstrates a positive correlation between regional creative culture and corporate risk-taking. His study investigates how creative culture influences corporate financial decision-making, particularly the extent to which firms' risk-taking behaviours and policies align with their local risk-taking propensities shaped by creative culture norms. The empirical results show that firms situated in areas with a strong creative culture exhibit higher levels of risk exposure, investment, and growth. Moreover, such firms tend to accumulate greater cash reserves—a likely precautionary act. Collectively, these findings underscore the risk-taking tendencies inherent in creative individuals and the broader creative culture.

Given the growing public awareness of the attributes of creative individuals, their higher concentration within a society may influence various aspects of its economy. For instance, Florida (2002) provides evidence that the creative class is essential for supporting economic growth due to its capacity for creative thought (Tufts, 2003; McGranahan & Wojan, 2007; Ucar, 2018). Leuenberger and Kluver (2006) argue that creative classes nurture a culture of creativity and that creative communities tend to foster practical, innovative solutions. Indeed, as mentioned, businesses headquartered in U.S. states characterised by strong creative environments produce more innovative outcomes—measured by the number of patents and patent citations (Ucar, 2018). Guggenmos and Van (2020) contend that such businesses enjoy a competitive edge, more distinctive business processes, and an enhanced ability to adapt swiftly to changing market conditions. However, creative individuals and firms also tend to exhibit greater risk-taking behaviour (Amabile, 1983; Dewett, 2006; Heilman, 2016; Plucker, 2016). Since local culture is intricately linked to firms through employees, customers, and suppliers (Chen et al., 2014), it is crucial to consider its influence on business practices.

Notwithstanding the above, and that Runco (2004) observes creative individuals to be highly sought after in societies and organisations due to their ability to produce original solutions and adapt to changing contexts, prior psychological literature also highlights that creativity can have deleterious consequences. Because both creativity and dishonesty involve "thinking outside the box" or challenging conventional boundaries, an individual's ability to innovate in problem-

solving or performance enhancement may also predispose them to unethical behaviour (Gino & Wiltermuth, 2014). Gino and Ariely (2012) demonstrate that innovative thinkers are more likely to exaggerate their achievements and to rationalise unethical actions. Indeed, creative individuals often find it easier to justify such behaviour (Gino & Ariely, 2012). This capacity for justification may, paradoxically, enable firms to legitimise certain taxation practices by leveraging the reasoning patterns of creative individuals to rationalise ethically ambiguous conduct.

Furthermore, the literature consistently identifies a strong link between creativity and risk-taking (Sitkin & Pablo, 1992; Tesluk et al., 1997; West, 1999; Dewett, 2004, 2006, 2007; Marade et al., 2007; Belbaly & Somsing, 2014; Shalley et al., 2017; Zhou & George, 2001). Creative individuals are often reported to be inherently inclined towards risk-taking (Amabile, 1983; Dewett, 2006; Heilman, 2016). As Zhou and George (2001) note, creativity entails "a departure from the status quo". Consequently, creative performance is influenced by the willingness to take risks (West & Sacramento, 2012; Shin & Eom, 2014; Isaksen et al., 1999). The capacity for risk-taking thus remains one of the most defining characteristics of creative individuals (Amabile, 1983; Dewett, 2006; Heilman, 2016).

Nevertheless, a creative culture emphasises and fosters an environment conducive to innovation and encourages open-mindedness among employees (Wang et al., 2010). Cameron et al. (2014) emphasise that firms adopting a creation-oriented approach tend to be R&D intensive. As R&D activity can be employed as part of an earnings management strategy (Roychowdhury, 2006), corporations may exploit this to reduce tax liability. Together, these arguments suggest that creative culture may be associated with higher levels of tax avoidance.

Conversely, the conceptual framework for creative culture emphasises innovation enhancing value creation (Quinn & Rohrbaugh (1983) and Cameron et al. (2014) yet engaging in earnings management—a practice known for its adverse impact on financial reporting quality—incurs costs due to the significant effort required (Zang, 2012). Furthermore, it diverts managerial attention and resources away from value-enhancing initiatives, as noted by Goldman and Slezak (2006).

The relationship between local creative culture and corporate tax avoidance can be understood through several theoretical perspectives that highlight the influence of social norms and informal institutions on corporate tax decisions. One relevant theoretical framework is Institutional Theory, which posits that organisations are shaped by the norms and values

prevalent within their institutional environment (DiMaggio & Powell, 1983). Empirical studies have shown that a country's institutional environment affects corporate reporting behaviour (Ball et al., 2000; Atwood et al., 2012), tax avoidance practices (Atwood et al., 2012), attitudes towards corporate ethics and tax compliance (Riahi, 2004; Demirbag et al., 2013), and even corporate social responsibility (CSR) (Muller & Kolk, 2012). Additionally, experimental research by Alm et al. (1999) demonstrates that social norms significantly influence taxpayers' compliance decisions.

In relation to tax avoidance, this is also true. Companies operating in regions characterised by high levels of creative culture are likely to be exposed to distinctive social norms that shape their perceptions and attitudes towards tax planning. Previous research has shown that both institutional environments and prevailing social norms play critical roles in influencing corporate tax behaviour (Boone et al., 2013; Hasan et al., 2017). Specifically, firms located in areas with strong creative cultures may engage in greater tax avoidance if such behaviour is perceived as legitimate and acceptable within that creative ecosystem; alternatively, they may refrain from tax avoidance due to a focus on value creation and innovation.

Another pertinent theoretical perspective is Social Identity Theory, which describes how individuals' identification with specific groups influences their behaviours (Tajfel & Turner, 1979). Within the behavioural sciences, individuals are not studied as isolated entities but collectively as members of social groups and cultures (Cullis & Lewis, 1997; Steinmo, 2017). In other words, attitudes and behaviours are shaped by informal institutions that reflect unwritten social norms, values, and beliefs. In the context of local creative culture, companies may identify strongly with the creative community and its values, leading to a higher or lower likelihood of engaging in tax avoidance, depending on whether it is perceived as normative behaviour within that social identity. According to Ucar (2019), firms located in highly creative cultures engage in more real earnings management and demonstrate greater risk-taking tendencies. Similarly, Ucar (2018) finds that firms based in areas with strong creative cultures exhibit higher innovation outputs, suggesting a heightened focus on innovation. Clearly, there may be either a positive or negative association between local creative culture and tax avoidance. This alignment with a creative identity may encourage firms to adopt tax avoidance strategies consistent with the perceived behaviours of their creative peers, reinforcing either a positive or negative relationship between creative culture and corporate tax avoidance.

Yet another is Behavioural Ethics Theory, which provides further insight into how situational factors influence ethical decision-making within organisations (Treviño et al., 2006). Behavioural ethics refers to conduct that reflects part of an individual's moral identity and is governed and assessed according to generally accepted ethical norms. The formation of this identity occurs through processes of social cognition (Bandura, 1986), and much of Identity Theory examines how personal identity emerges through interactions and social reference points (Tajfel, 1959, 1974; Tajfel & Turner, 1979; Turner & Oakes, 1986). The ethical behaviours of individuals are significantly affected by the attitudes and actions of their peers, with the frequency and intensity of interaction amplifying this influence (Zey-Ferrell et al., 1982). Simple factors, such as the amount of time spent with co-workers, can also affect the salience of workplace-defined identities relative to other social identities (Weaver & Agle, 2002; Reed et al., 2007). Organisational structure—both symbolic and tangible—also plays an important role in identity formation. To the extent that employees can carve out private "identity spaces" within their organisations, they may be better able to preserve identities distinct from their professional roles (Weaver, 2006, p. 353), for example.

Hence, companies operating in highly creative regions may experience a distinctive set of situational factors that influence their tax behaviour through the identities and behaviours of their employees. Creative contexts are often characterised by a strong emphasis on innovation and resourcefulness, which may extend to individuals' approaches to tax planning and potentially result in either a higher or lower propensity for tax avoidance. This theoretical perspective provides valuable insights into how situational characteristics that shape individual and collective identities can influence the relationship between local creative culture and corporate tax behaviour.

In summary, the relationship between local creative culture and corporate tax avoidance can be understood through multiple theoretical perspectives that highlight the roles of social norms, institutional environments, social identity, and behavioural ethics in shaping tax decision-making. By integrating these frameworks, it is possible to develop a more comprehensive understanding of the complex and multifaceted interplay between creative culture and corporate tax avoidance behaviour. Ultimately, the question of whether local creative culture increases or decreases corporate tax avoidance remains an empirical one. Based on the preceding discussion, we therefore propose the central hypothesis of this study as follows:

H1: Local creative culture is significantly associated with corporate tax avoidance.

2.2.4 Tax Uncertainty, Local Creative Culture and Tax Avoidance

Regardless of our analysis and the assumed direct relationship between local creative culture and tax avoidance, it remains theoretically unclear whether local creative culture exerts differing influences on the tax practices of firms with distinct financial profiles. Companies encounter diverse circumstances that may lead them to adopt varying approaches to tax avoidance, depending on their financial situations and constraints. For instance, firms facing heightened uncertainty may choose to retain larger cash reserves as a precautionary measure to mitigate risks associated with unpredictable market conditions and economic volatility (Dittmar et al., 2003). At the same time, other firms experiencing significant financial constraints may increase their engagement in tax avoidance activities as a means of alleviating financial pressures (Desai & Dharmapala, 2006). Such constraints often restrict access to external funding sources, prompting firms to maximise the use of internal resources—including tax planning—to offset financial limitations. Accordingly, variations in financial circumstances can potentially moderate the relationship between local creative culture and corporate tax avoidance, as firms adjust their tax strategies to align with their respective financial contexts.

Furthermore, tax uncertainty may interact with local creative culture to shape firms' tax avoidance behaviours. When confronted with uncertainty in the tax environment, firms in settings with creative cultures may adopt more aggressive tax avoidance strategies. The emphasis on resourcefulness and adaptability inherent in creative cultures may enable these firms to identify and exploit novel tax planning opportunities to manage tax uncertainty effectively. Conversely, in regions characterised by strong creative cultures, firms may also display heightened sensitivity to prevailing social norms and ethical considerations (Ucar, 2019). A strong sense of social identity within the creative community may discourage firms from pursuing overly aggressive tax avoidance strategies, even amid tax uncertainty. In such contexts, firms may prioritise ethical conduct and corporate social responsibility, leading to a more conservative stance toward tax planning, despite external ambiguities.

Thus, tax uncertainty is expected to influence the relationship between local creative culture and corporate tax avoidance. Firms in highly creative regions may respond to tax uncertainty in different ways, shaped by their organisational risk appetite, ethical orientation, and adaptive capabilities. Some may adopt more aggressive tax avoidance practices as a strategic response to uncertainty, leveraging their innovative mindset and creative problem-solving orientation. Others may choose a more conservative path to align with community values and ethical

expectations. Therefore, tax uncertainty may either amplify or mitigate the influence of local creative culture (LCC) on tax avoidance behaviour, depending on how firms balance creativity, ethics, and risk. We therefore hypothesise as follows:

H2: Tax uncertainty moderates the association between local creative culture and corporate tax avoidance.

2.3 Research Methodology

2.3.1 Sample

To investigate our research question, our sample includes firms in the USA between 1990 and 2022. We collect data from the Compustat database to construct our dependent variable (tax avoidance) measures. Our main variable of interest is CreativeShare, which captures the proportion of the creative class in a county. Local creative share information is obtained from the U.S. Department of Agriculture's Economic Research Service (ERS)[1].

Because county-level creative culture data are available only for 1990, 2000, and 2007, we use linear interpolation to estimate values for the intervening years, consistent with Ucar (2018, 2019). For the period beyond the last available observation (post-2007), the CreativeShare variable is extended by carrying forward the most recent observed value (2007) for each county, rather than relying on extrapolation. This approach avoids imposing strong assumptions about the evolution of local creative labour markets outside the observed data range.

This is particularly important given the presence of major structural shocks during the post-2007 period, including the global financial crisis (2008–2009) and the COVID-19 pandemic, which may have significantly altered local labour market dynamics and the composition of creative occupations. While this method does not capture potential time variation after 2007, it provides a conservative and transparent approximation that reduces the risk of measurement error associated with extrapolated trends.

While this approach is appropriate for capturing gradual changes in local cultural characteristics, it may introduce measurement error, as interpolated values are estimated rather

[1] http://www.ers.usda.gov/data-products/creative-class-county-codes/

than directly observed. This limitation is common in studies that rely on infrequently observed regional variables. To address this concern and ensure the robustness of our findings, we conduct additional analyses using only the observed benchmark years (1990, 2000, and 2007), following Ucar (2018), to verify whether our results remain consistent when relying solely on actual data points.

In addition, to ensure that the findings are not driven by the treatment of post-2007 values, we perform robustness tests by restricting the sample to the pre-2007 period, yielding consistent results.

Following prior studies, we exclude firms in highly regulated utilities (SIC 4900–4999) and financial (SIC 6000–6999) industries. We also drop firm-year observations with missing values for CreativeShare. This results in a final sample of 33,011 firm-year observations, with complete data for local creative culture, tax avoidance measures, and firm-level control variables. See **Table 2-1**.

Table 2-1: Sample Selection

	N. Firm-Year	**N. Firms**
LCC data available from ERS after merging with COMPUSTAT	246,875	18,653
After (-) firms (SIC 4900–4999), (SIC 6000–6999)	151,952	14,105
After (-) firm year observation without any missing value	57,678	8,721
= firm year observation for data analysis:		
Observation with CETR data	33,011	8,721

2.3.2 Dependent Variable: Tax Avoidance

To measure corporate tax avoidance, we employ two indicators: one for the main analysis—the cash effective tax rate (CETR)—and another for the robustness test—the GAAP effective tax rate (ETR).

First, CETR is calculated as the ratio of cash taxes paid to pre-tax book income minus special items. This measure is widely adopted in the literature (Armstrong et al., 2012; Hasan et al., 2014; Kubick et al., 2015). Because CETR directly reflects the proportion of income actually paid in taxes, it provides valuable insight into the extent to which firms effectively minimise their tax payments. Following Dyreng et al. (2008), CETR is considered a more powerful indicator of tax avoidance, as it incorporates the tax benefits associated with employee stock

options and is not influenced by changes in accounting estimates. Consistent with Hasan et al. (2014), we winsorize CETR to the [0, 1] interval to ensure valid economic interpretation, where higher CETR values correspond to lower levels of tax avoidance, and lower CETR values indicate higher tax avoidance activity.

Second, the GAAP effective tax rate (ETR) is calculated by dividing total tax expense by pre-tax book income. The book ETR captures a firm's accrual-based tax burden and reflects tax avoidance strategies that generate permanent differences (Dyreng et al., 2010). This measure is used as a robustness check to validate the consistency of results derived from the CETR measure.

In addition, we calculate these two measures using the long-run (five years) CETR and the long-run (five years) GAAP Effective Tax Rate (ETR), in order to avoid significant year-to-year variations on a single-year tax-avoidance measure (Dyreng et al., 2008; Chen et al., 2010; Hope et al., 2013; Lennox et al., 2013; Lisowsky et al., 2013).

The first measure, CETR, calculates companies' cash effective tax rates by using the total taxes paid in cash over the last five years scaled by total pre-tax income net of total special items over the same period. It considers both permanent and temporary book-tax differences.

CETR = TXPD5 / PI5 – SPI5

PI5 = pre-tax book income (#170) over the most recent five years.

SPI5 = special items (#17) over the most recent five years.

Our second measure, ETR, is the ratio of total tax expense over the most recent five years scaled by total pre-tax income net of total special items over the same period. It detects a company's tax avoidance via its permanent book-tax differences, such as investments in municipal bonds and participation in tax shelters.

ETR = TXT5 / PI5 – SPI5

TXT5 = total income tax expense (#16) over the most recent five years.

Our results are consistent with those in the literature (e.g., Dyreng et al., 2008; Hope et al., 2013) in that we truncate our measure to the range [0, 1] and remove observations with negative total pre-tax income, net of total special items, over the last five years.

2.3.3 Independent Variable: Local Creative Culture

To measure local creative culture in this study, we employ the proportion of the local creative class in a local population, which Leuenberger and Kluver (2006) identify as a vital component in shaping creative culture. The variable, denoted as CSHARE, is obtained from the ERS, which provides comprehensive county-level data on the creative share and detailed classifications of creative class occupations. According to the ERS documentation, the dataset includes occupations that require a high degree of creative thinking, such as those in architecture, engineering, arts, design, entertainment, sports, media, business and financial operations, computer and mathematical sciences, and management (Ucar, 2018). In line with the ERS definition, the creative share is calculated based on the proportion of occupations that demand a high level of creativity within each county. Further details on the dataset and its construction are provided in the Appendix.

2.3.4 Empirical Model

To test the first hypothesis (**H1**), we examine the relationship between corporate culture, represented by the variable CSHARE, and tax avoidance. The regression model is specified as follows:

$$\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ CSHARE_{i,t} + \beta 2\ MTB_{i,t} + \beta 3\ LEV_{i,t} + \beta 4\ FI_{i,t} + \beta 5\ PPE_{i,t} + \beta 6\ INTAN_{i,t} + \beta 7\ EQUITY_{i,t} + \beta 8\ RD_{i,t} + \beta 9\ ROA_{i,t} + + \beta 10\ CNOL_{i,t} + \beta 11\ NOL_{i,t} + \beta 12\ ACCRUALS_{i,t} + \beta 13\ MASCORE_{i,t} + \beta 14\ PT_{i,t} + \beta 15\ SIZE_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$$

To investigate our second hypothesis (**H2**), we perform an empirical analysis measuring the effect of tax uncertainty on the relationship between local creative culture and tax avoidance. The model is articulated as follows:

$$\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ CSHARE_{i,t} + Uncertainty_{i,t} + Uncertainty_{i,t} * CSHARE_{i,t} + Control\ variables_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$$

where the dependent variable Tax Avoidance is measured by CETR for firm i in the five-year long run. Our main variable of interest is the share of creative culture (CSHARE), defined as the proportion of the creative class in a given county (Ucar, 2018).

We include several firm-specific characteristics to control for potential factors that may influence firms' tax avoidance activities. Prior studies (e.g., Stickney & McGee, 1982;

Zimmerman, 1983; Mills et al., 1998; Rego, 2003; Chen et al., 2010; Cheng et al., 2012) suggest that the complexity of business operations and economies of scale are associated with corporate tax avoidance. Larger firms and those with more complex operational structures often possess greater resources and expertise to exploit tax planning opportunities and establish tax shelters.

Accordingly, we incorporate a range of control variables, including the market-to-book ratio (MTB), leverage ratio (LEV), income from foreign operations (FI), total plant, property, and equipment (PPE), intangible assets (INTANG), income related to the equity method (EQUITY), and research and development activities (RD), to account for firms' operational complexity and economies of scale. These variables are expected to be positively associated with tax avoidance. We also include return on assets (ROA), net operating loss carryforwards (NOL), and change in net operating loss (CNOL) as proxies for firms' incentives to avoid income taxes (Rego, 2003; Chen et al., 2010). In addition, we control for firms' total accruals (ACCRUALS), given that Frank et al. (2009) report a positive association between earnings management and tax avoidance.

To capture managerial quality, we adopt the managerial ability score (MA_SCORE) developed by Demerjian et al. (2012), as Koester et al. (2016) find that higher-ability managers are more likely to engage in strategic tax planning activities. We also follow prior research in controlling for patent activity (PT) as an indicator of innovation intensity.

Year (t) and industry (i) fixed effects are included in all models to account for unobserved time-invariant and industry-specific characteristics. All independent variables are lagged by one year to mitigate potential reverse causality concerns. The definitions of all variables are presented in the Appendix.

We define tax uncertainty (Uncertainty) and measure it, following Hanlon et al. (2017), who establish tax uncertainty as a significant determinant of corporate cash holdings. Their findings indicate that increased cash holdings represent an important economic consequence of tax avoidance. Detailed definitions of all variables are provided in the Appendix.

2.4 Analysis Results and Discussion

2.4.1 Summary Statistics and Correlations

Table 2-2 presents summary statistics that are consistent with those of previous studies. The average firm in our sample is located in a county where almost 29.4% of the population is

employed in creative class occupations, as measured by CreativeShare. The table also presents the descriptive statistics of the measures of CETR, CreativeShare, and several control variables used in this study. The mean values of CETR and ETR are 0.217 and 0.214, respectively. Hence, the CETR is 21% on average. This is comparable with previous studies (Dyreng et al., 2010; Ling et al., 2017). The mean value of local creative culture (CSHER) is 0.30, which is consistent with the mean value reported in Ucar (2018) and Costa and Habib (2023).

Table 2-2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
CETR	33011	0.217	0.211	0.000	1.000
CSHARE	33011	0.302	0.068	0.165	0.470
MTB	33011	2.984	7.090	-25.68	44.16
LEV	33011	0.318	0.484	0.000	3.495
FI	33011	0.007	0.030	-0.103	0.148
PPE	33011	0.290	0.291	0.001	1.479
INTAN	33011	0.174	0.269	0.000	1.594
EQUITY	33011	0.000	0.004	-0.021	0.024
RD	33011	0.062	0.129	0.000	0.793
ROA	33011	-0.016	0.428	-2.781	0.424
CNOL	33011	0.151	0.643	-1.352	4.499
NOL	33011	1.434	4.525	0.000	33.77
ACCRUALS	33011	-0.122	0.343	-2.540	0.508
MA SCORE	33011	0.001	0.126	-0.223	0.535
PT	8618	22.27	57.87	1.000	398.0
SIZE	33011	4.889	2.422	-6.908	13.61

Notes: The sample becomes smaller when considering patents. Available patent data are only for the years 1990 to 2017. The sample decreases to 8618.

The average firm size in our sample is large (SIZE = 4.88), with strong growth opportunities (MTB = 2.98), but a negative mean profitability (ROA = -0.016), although the median ROA is 0.095. The leverage ratio is low (LEV = 0.31), and the managerial ability score is relatively low (MA SCORE = 0.001).

Table 2-3 presents the correlation matrix for CSHARE, CETR, and other firm control variables in the sample of this study. A negative and significant correlation is found between CETR and CSHARE (positive and significant correlation between TA and CSHARE) (correlation coefficient 0.02, $p < 0.01$). Univariate analysis suggests that firms located in more creative counties are more likely to engage in tax avoidance practices. This table shows that the correlation between CSHARE and CETR is -0.054. The correlation matrix, therefore, provides an initial indication that local creativity increases firm-level tax avoidance activities. The CSHARE is positively associated with firm size (SIZE), market-to-book ratio (MTB), income from foreign operations (FI), intangible assets (INTANG), research and development activities (RD), change in net operating loss (CNOL), net operating loss carryforwards

(NOL), managerial ability score (MA_SCORE), and religiosity (RELIG). In contrast, the CSHARE is negatively associated with leverage ratio (LEV), total plant, property and equipment (PPE), income related to the equity method (EQUITY), return on asset (ROA), and total accruals (ACCRUAL).

Table 2-3: Pairwise Correlations

Variables	1	2	3	4	5	6	7	8	9
(1) CETR	1.000								
(2) CSHARE	-0.054***	1.000							
(3) MTB	-0.030***	0.057***	1.000						
(4) LEV	-0.137***	-0.043***	-0.092***	1.000					
(5) FI	0.043***	0.046***	0.032***	-0.038***	1.000				
(6) PPE	-0.043***	-0.221***	-0.024***	0.244***	-0.017***	1.000			
(7) INTAN	-0.011**	0.096***	0.023***	0.236***	0.042***	-0.104***	1.000		
(8) EQUITY	0.038***	-0.052***	0.001	0.003	0.080***	0.050***	-0.002	1.000	
(9) RD	-0.199***	0.195***	0.067***	-0.001	-0.072***	-0.246***	-0.100***	-0.072***	1.000
(10) ROA	0.228***	-0.069***	0.044***	-0.289***	0.152***	0.151***	0.066***	0.066***	-0.471***
(11) CNOL	-0.131***	0.047***	0.021***	0.283***	-0.073***	-0.005	0.054***	-0.045***	0.273***
(12) NOL	-0.224***	0.063***	-0.007*	0.420***	-0.078***	-0.072***	0.014***	-0.047***	0.371***
(13) ACCRUALS	0.159***	-0.032***	0.028***	-0.377***	0.090***	-0.063***	-0.085***	0.057***	-0.184***
(14) MA_SCORE	-0.002	0.078***	0.069***	-0.039***	0.103***	-0.149***	-0.052***	-0.005	0.139***
(15) Patent	-0.035***	0.105***	0.032***	0.001	0.240***	0.007	0.061***	0.098***	-0.053***
(16) SIZE	0.119***	0.040***	0.007	-0.143***	0.232***	0.101***	0.124***	0.121***	-0.244***

Variables	10	11	12	13	14	15	16
(10) ROA	1.000						
(11) CNOL	-0.531***	1.000					
(12) NOL	-0.611***	0.538***	1.000				
(13) ACCRUALS	0.564***	-0.464***	-0.494***	1.000			
(14) MA_SCORE	0.080***	-0.046***	0.049***	0.032***	1.000		
(15) Patent	0.124***	-0.067***	-0.093***	0.033***	0.159***	1.000	
(16) SIZE	0.431***	-0.295***	-0.441***	0.286***	-0.047***	0.454***	1.000

Notes: This table reports the Pearson correlation coefficients. Variables are defined in the Appendix. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

2.4.2 Regression Results and Discussion

Our linear regression analysis reveals a significant positive association between local creative culture and tax avoidance. However, it is essential to acknowledge that local creative culture may also serve as a moderating influence that curbs tax avoidance. Firms that prioritise ethical standards and corporate social responsibility may refrain from engaging in aggressive tax strategies to safeguard their public reputation and align with societal expectations. Moreover, the long-term strategic orientation typically observed in creative firms may discourage participation in risky tax avoidance practices due to potential legal and reputational repercussions.

Several prior studies support the notion that creative and socially responsible firms often adopt more conservative tax strategies for ethical and reputational reasons. For instance, Lanis and Richardson (2015) find that firms with higher CSR scores are less likely to engage in aggressive tax avoidance. Similarly, Austin and Wilson (2017) observe that reputational risks associated with tax avoidance can dissuade firms from pursuing such strategies, particularly in environments where ethical behaviour is highly valued.

Table 2-4 presents the baseline model estimates obtained using Ordinary Least Squares (OLS) regression with county-level clustered standard errors. The dependent variables are CETR and ETR, representing two distinct measures of corporate tax avoidance. The CETR regressions include 33,011 firm-year observations, while the ETR regressions are based on 40,915 firm-year observations[2]. The coefficient on CSHARE, our primary variable of interest, is negative and statistically significant, indicating that firms headquartered in counties with a higher proportion of the workforce employed in creative occupations engage in greater levels of tax avoidance.

Sample attrition in the CETR regression primarily arises from additional data requirements necessary for constructing the CETR variable. The coefficients on CSHARE are negative and significant at the 1% level across all model specifications, measuring -0.033 and -0.028, respectively, when CETR and ETR are used as dependent variables. These results demonstrate that the corporate tax avoidance practices of U.S. firms are significantly and positively

[2] In the 3rd and 4th columns of Table 2-4, we added the patents for our OLS regression models, but this reduced the size of the sample. We exclude this variable (Patent) in the other columns.

associated with the level of creative culture surrounding their headquarters, after controlling for firm-specific characteristics.

Table 2-4: The Linear Regression

	(1) CETR	(2) CETR	(3) CETR	(4) CETR
CSHARE	-0.116**	-0.125***	-0.098**	-0.085***
	(0.053)	(0.033)	(0.049)	(0.027)
Uncertainty	-	-	-0.423***	-0.297***
			(0.146)	(0.103)
CSHARE * Uncertainty	-	-	-	-2.616*
				(1.369)
MTB	-0.000	-0.001***	-0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
LEV	-0.017	-0.028***	-0.024***	-0.029***
	(0.013)	(0.005)	(0.008)	(0.005)
FI	-0.048	0.090*	0.095	0.118**
	(0.071)	(0.054)	(0.069)	(0.046)
PPE	-0.063***	-0.065***	-0.069***	-0.096***
	(0.022)	(0.010)	(0.016)	(0.008)
INTAN	-0.017	-0.010	-0.009	-0.024***
	(0.013)	(0.008)	(0.011)	(0.007)
EQUITY	1.463*	1.051***	0.931	0.991**
	(0.780)	(0.383)	(0.707)	(0.436)
RD	-0.279***	-0.225***	-0.259***	-0.322***
	(0.036)	(0.021)	(0.036)	(0.023)
ROA	0.079***	0.064***	0.069***	0.085***
	(0.016)	(0.006)	(0.011)	(0.010)
CNOL	-0.006	0.003	-0.001	0.001
	(0.005)	(0.003)	(0.005)	(0.005)
NOL	-0.005***	-0.003***	-0.004***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
ACCRUALS	-0.005	-0.014**	-0.029**	-0.035***
	(0.018)	(0.007)	(0.012)	(0.011)
MA_SCORE	-0.015	-0.008	-0.008	0.007
	(0.020)	(0.013)	(0.018)	(0.013)
Patent	-0.000***	-	-	-
	(0.000)			
SIZE	0.006***	0.010***	0.006***	0.004***
	(0.002)	(0.001)	(0.002)	(0.001)
CONSTANT	0.252***	0.238***	0.227***	0.221***
	(0.024)	(0.012)	(0.020)	(0.007)
R^2	0.158	0.146	0.132	0.090
F	24.220	60.463	29.469	80.449
Clustering	Firm/year	Firm/year	Firm/year	Firm/year
N	8618	33011	13104	13104

Notes: Columns 1 and 2 report the results from OLS regressions of the association between local creative culture and tax avoidance. Column (1) reports the results from OLS regressions of the association between local creative culture and tax avoidance after taking patent activity (PT) into consideration. Column (2) reports the same results from OLS regressions of the association between local creative culture and tax avoidance excluding patent activity (PT). Columns (3) and (4) report the results from OLS regressions of the association between creative culture and tax avoidance moderated by tax uncertainty (Uncertainty). Column (3) uses Uncertainty as a control variable in the main model. Column (4) uses Uncertainty as a moderator variable. Standard errors are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered by firm. Definitions of variables are presented in the Appendix.

The findings are consistent with Hypothesis 1 (**H1**). Moreover, the results are economically significant. In the CETR regression, the coefficient on CSHARE suggests that an increase in CSHARE from the 25th percentile (0.254) to the 75th percentile (0.347) would raise the effective tax avoidance level, reducing the tax rate to approximately 0.330. The coefficients on CSHARE remain consistently negative across all models: -0.116 in Column (1), -0.110 in Column (2), -0.125 in Column (3), -0.142 in Column (4)[3], -2.61 in Column (5), -3.03 in Column (6), -0.059 in Column (7), and -0.137 in Column (8).

Taken together, these findings provide robust support for both **H1** and **H2**, confirming that firms located in regions with a stronger creative culture demonstrate higher levels of tax avoidance activity.

In terms of economic significance, the reported coefficient on CSHARE for the full model (Columns 1 and 2) suggests that a one standard deviation increase in CSHARE increases CETR by -1.12% [-0.116 (the coefficient on CSHARE) × 0.068 (standard deviation of CSHARE) × 100] and ETR by almost -1% [-0.110 (the coefficient on CSHARE) × 0.068 (standard deviation of CSHARE) × 100][4].

The sign and significance of the control variables are generally consistent with the prior tax avoidance literature. Tax avoidance is higher for a firm with a higher market-to-book ratio (MTB). In addition, CETR and ETR are higher for firms with more income from foreign operations (FI), more income related to the equity method (EQUITY), firms with more change in net operating loss (CNOL), and firms with big size (SIZE). CETR and ETR are higher for firms with operating profit (ROA), and less for firms with high asset tangibility (INTAN). Leverage ratio (LEV), total plant, property, and equipment (PPE), research and development activities (RD), net operating loss carry forwards (NOL), companies' total accruals (ACCRUALS), managerial ability score (MA_SCORE), and patent activity (PT) show positive and significant relationships with tax avoidance.

Without the influence of the moderator, we assume that local creative culture has a constant effect on tax avoidance activity, but the interaction term reveals that this relationship changes, depending on the tax uncertainty level. Note that it does not necessarily mean the effects of local creative culture or uncertainty by themselves are unimportant, but instead that the

[3] The patent is only included in columns 3 and 4. This is because available patent data reduces the sample size. It was added to prove that the relationship remains strong and important even after controlling for patent activity.
[4] Having a negative sign indicates a negative relationship between creative culture and tax expenditure (a positive relationship between creative culture and tax avoidance).

interaction term complements their explanation of tax avoidance activities. The analysis presented in **Tables 2-4** (Columns 3 and 4) examines the impact of tax uncertainty on the relationship between local creative culture and tax avoidance. Our analysis, as presented in this table, illustrates the influence of tax uncertainty on the relationship between local creative culture and tax avoidance. The results consistently unveil positive and significant coefficients for the main variable of interest, which represents the interaction term between the local creative culture and tax uncertainty, signifying the impact of local creative culture (CSHARE) on tax avoidance ($p < 0.05$).

The results reported in **Table 2-4** document the relationship among tax avoidance, local creative culture, and tax uncertainty. The statistically significant coefficient estimates on CETR and ETR indicate that CSHARE is positively associated with tax avoidance in firms with a high percentage of tax uncertainty. In firms with a high level of uncertainty, the effect of CSHARE is significant and negative in a test of the sum of the coefficient estimates on the CETR and CSHARE * Uncertainty. Also, in **Table 2-4**, we see that firms with greater tax uncertainty hold more cash. The volatility of cash holdings (we measure cash holdings with uncertainty here) and CSHARE are positively correlated with cash holdings, consistent with the precautionary motive for holding cash and consistent with the work of Bates et al. (2009).

Furthermore, the findings from this analysis consistently reveal positive and significant coefficients for the main variable of interest, namely the interaction term between the local creative culture and tax avoidance. By incorporating these empirical findings, our study contributes to the existing literature by highlighting the positive and significant relationship between local creative culture and tax avoidance, specifically in tax uncertainty. The results indicate that the relationship between the local creative culture and tax avoidance becomes even more pronounced in the presence of greater tax uncertainty. This suggests that companies situated in regions characterised by a stronger culture of innovation tend to engage in greater tax avoidance practices, particularly when faced with elevated levels of uncertainty.

Our research sheds light on the tax management strategies employed by innovative companies and their propensity to mitigate tax burdens in environments marked by both uncertainty and a thriving creative culture. This result supports **H2**.

2.5 Endogeneity Tests

In this section, we check for endogeneity through various tests. One common concern is the potential bias caused by omitting relevant variables, which can be mitigated by including as

many explanatory variables as possible. However, this approach is not always feasible due to limited data availability and the use of proxies that may introduce measurement errors. To strengthen our finding regarding the positive relationship between creative culture and tax avoidance, we control for several factors that influence tax avoidance. Despite these efforts, we acknowledge the possibility of lingering omitted variable bias as mentioned earlier.

However, we conduct the second stage of the Two-Stage Least Squares (2SLS) with an instrumental variable (IV) and the Propensity Score Matching (PSM) test where we find a significant and negative coefficient for the variable CSHARE.

2.5.1 Two-Stage Least Squares

Local Creative Culture and ART Share

Based on the results of the tests in **Table 2-5**, evidence is available to identify the effect of creative culture and affirm a positive relationship between local creative culture and corporate tax avoidance. To re-examine this impact, we further investigate the identification of the creative culture effect by using a Two-Stage Least Squares (2SLS) regression model with an instrumental variable (IV) approach. In line with Ucar (2019), we use ART share as an IV, which is a measure of the proportion of people in a county who are employed in the arts. Along with these individuals, CSHARE includes a broader group of occupations; ART share is thus a subset of CSHARE—the creative class. Building on Ucar (2019), it is reasonable to expect that ART share and CSHARE are correlated in capturing a culture of creativity and risk-taking within a local area, while remaining plausibly exogenous to firm-level tax avoidance decisions, except through the creative culture channel. It is therefore reasonable to use ART share as a valid instrument.

In **Table 2-5**, we present the results of the second stage of the 2SLS, which uses ART share as the IV for CSHARE. The creative culture effect exhibits negative and statistically significant coefficients in CETR, indicating higher levels of tax avoidance in more creative regions. The IV approach provides further evidence of the creative culture effect on corporate tax avoidance after addressing potential endogeneity concerns. Accordingly, this table, together with the additional tests in this section, demonstrates that local creative culture is a significant determinant of corporate tax avoidance across regions.

To further assess the validity of the identification strategy, we report a set of standard diagnostic tests for instrument relevance and strength. First, the Kleibergen–Paap rk LM statistic is highly significant (Chi-sq.= 2451.24, $p < 0.001$), indicating that the model is well identified and

confirming that the instrument is sufficiently correlated with the endogenous variable. Second, instrument strength is evaluated using both the Cragg–Donald Wald F statistic and the Kleibergen–Paap rk Wald F statistic. The Kleibergen–Paap rk Wald F statistic is 21,944.80, which substantially exceeds the Stock–Yogo critical values (e.g., 16.38 at the 10% maximal IV size), indicating that the instrument is not weak. Consistent with this, the first-stage F-statistic of the excluded instrument (F= 21,944.80, $p < 0.001$) is well above the conventional threshold of 10, further supporting instrument relevance.

Table 2-5: Two-Stage Least Squares (2SLS)

Dependent Variables	**1st Stage CSHARE**	**2nd Stage CETR**
ART share	4.079***	-
	(0.027)	
CSHARE	-	-0.110***
		(0.031)
MTB	0.000***	-0.001***
	(0.000)	(0.000)
LEV	-0.000***	-0.028***
	(0.001)	(0.003)
FI	0.045***	0.089**
	(0.009)	(0.036)
PPE	-0.018***	-0.065***
	(0.002)	(0.006)
INTAN	0.003**	-0.010**
	(0.001)	(0.005)
EQUITY	-0.511***	1.060***
	(0.069)	(0.272)
RD	0.112***	-0.227***
	(0.004)	(0.013)
ROA	0.007***	0.064***
	(0.002)	(0.005)
CNOL	-0.000	0.003
	(0.001)	(0.003)
NOL	-0.000***	-0.003***
	(0.000)	(0.000)
ACCRUALS	-0.006***	-0.014**
	(0.002)	(0.006)
MA_SCORE	0.014***	-0.009
	(0.003)	(0.008)
SIZE	0.002***	0.010***
	(0.000)	(0.001)
_cons	0.162***	0.263***
	(0.006)	(0.025)
R-squared	0.419	0.146
Fixed effects	Yes	Yes
Observations	33011	33011

Notes: This table reports Two-Stage Least Square (2SLS) regression results using different measures of tax avoidance, CETR and ETR, respectively. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. Standard errors are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Refer to Appendix for variable definitions.

In addition, weak-instrument-robust inference tests are conducted. The Anderson–Rubin Wald test and the Stock–Wright LM S statistic are both statistically significant ($p < 0.05$), suggesting

that the estimated relationship remains robust even under potential weak instrument concerns. Collectively, these diagnostic results provide strong support for the relevance and strength of the instrument, reinforcing the credibility of the causal interpretation of the 2SLS estimates.

In the regression models, tax avoidance is the dependent variable (CETR). CSHARE measures the number of people employed in creative class occupations in the county where a sample firm is located. In addition, the test includes the aforementioned MTB, LEV, FI, PPE, INTAN, EQUITY, RD, ROA, CNOL, NOL, ACCRUALS, MA_SCORE, and SIZE, which are defined in the Appendix. The models also control for year, industry, and county fixed effects. Only CSHARE is reported for brevity.

2.5.2 Propensity Score Matching Test

It is possible for firms located in areas high in creative culture to be systematically different from firms located in areas low in creative culture, across many dimensions. These observable differences cannot be adequately controlled for by the previously employed linear model. Thus, to do so, the Propensity Score Matching (PSM) approach (e.g., Shipman et al., 2017) is adopted. All relevant control variables are included in the propensity score estimation, excluding variables that may be mechanically related to the construction of the independent variable (CSHARE), such as PI.

Firms are classified into treatment and control groups based on a median split of CSHARE. Firms located in counties with above-median CSHARE are assigned to the treatment group (high creative culture), while those below the median are assigned to the control group (low creative culture).

Table 2-6: Propensity Score Matching (PSM)

Variable	(1) CETR	(2) ETR	(3) CETR	(4) ETR
CSHARE	-0.061*	-0.089***	-0.046	-0.091*
	(0.034)	(0.031)	(0.054)	(0.053)
CSHARE * Uncertainty	-	-	-5.735*	-2.505
			(3.356)	(3.170)
MTB	-0.001***	-0.001***	-0.000	-0.001
	(0.000)	(0.000)	(0.001)	(0.000)
LEV	-0.042***	-0.025***	-0.045***	-0.026**
	(0.007)	(0.005)	(0.013)	(0.012)
FI	0.225***	0.119	0.047	0.034
	(0.083)	(0.078)	(0.099)	(0.100)
PPE	-0.110***	-0.027***	-0.086***	0.007
	(0.009)	(0.008)	(0.020)	(0.019)
INTAN	-0.036***	-0.001	-0.022	-0.014
	(0.011)	(0.009)	(0.017)	(0.016)

EQUITY	0.626	0.305	0.563	0.294
	(0.521)	(0.481)	(1.004)	(1.026)
RD	-0.296***	-0.254***	-0.192***	-0.160***
	(0.042)	(0.032)	(0.072)	(0.057)
ROA	0.103***	0.095***	0.123***	0.124***
	(0.011)	(0.008)	(0.023)	(0.019)
CNOL	0.017**	0.007	0.025*	0.011
	(0.006)	(0.005)	(0.013)	(0.011)
NOL	-0.005***	-0.003***	-0.007***	-0.003**
	(0.001)	(0.001)	(0.002)	(0.001)
ACCRUALS	-0.020	-0.013	0.004	0.005
	(0.012)	(0.009)	(0.026)	(0.021)
MA_SCORE	0.022	0.101***	-0.002	0.036
	(0.021)	(0.019)	(0.029)	(0.028)
SIZE	0.003***	0.013***	0.003	0.010***
	(0.001)	(0.001)	(0.002)	(0.002)
_cons	0.288***	0.215***	0.231***	0.166***
	(0.012)	(0.011)	(0.015)	(0.015)
R^2	0.088	0.119	0.133	0.133
F	55.810	94.925	13.656	18.278
N	8114	9818	3185	3607

Notes: Columns (1), (2), (3), and (4) of Table 2-6 present the results using Propensity Score Matching (PSM) to mitigate potential endogeneity concerns. We identify a group of control firms that are comparable to treatment firms based on all observable control variables in H1 and H2. Standard errors are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Definitions of variables are presented in the Appendix.

The propensity scores are estimated using a probit model, where the dependent variable is an indicator for treatment status. The model includes the same set of covariates used in the baseline regressions, including MTB, LEV, FI, PPE, INTAN, EQUITY, RD, ROA, CNOL, NOL, ACCRUALS, MA_SCORE, and SIZE, in addition to year and industry fixed effects.

The aim is to construct a matched sample in which firms in high creative culture areas (treatment group) are paired with comparable firms from low creative culture areas (control group) based on similar propensity scores, following Peel (2018). The matching procedure is implemented using one-to-one nearest-neighbour matching with replacement and a maximum calliper distance of 0.001. **Table 2-6** presents the regression results based on the matched sample. The findings are broadly consistent with the main analysis, indicating that local creative culture is positively associated with tax avoidance. Moreover, the results show that uncertainty moderates the relationship between local creative culture and tax avoidance. Overall, the PSM results reinforce the baseline findings and further alleviate concerns related to endogeneity.

Table 2-7 presents the covariate balance diagnostics before and after matching. Prior to matching, noticeable differences are observed between treated and control firms across several characteristics. However, after matching, these differences are substantially reduced. In particular, the mean standardised bias decreases from 12.6% to 1.5%, and the median bias from 11.5% to 1.5%, indicating a significant improvement in covariate balance.

Table 2-7: Covariate Balance Before and After Matching

Variable	Treated (Before)	Control (Before)	Bias (%) Before	Treated (After)	Control (After)	Bias (%) After
MTB	3.0426	2.3827	13.4	3.0200	3.0965	-1.5
LEV	0.2515	0.3060	-16.2	0.2516	0.2597	-2.4
FI	0.0129	0.0078	15.7	0.0127	0.0133	-1.9
PPE	0.2191	0.3306	-44.4	0.2194	0.2243	-1.9
INTAN	0.2009	0.1706	12.8	0.2010	0.2084	-3.1
EQUITY	0.0003	0.0008	-10.2	0.0004	0.0004	-2.0
ROA	0.0556	0.0752	-8.0	0.0560	0.0578	-0.7
CNOL	0.0650	0.0500	4.7	0.0643	0.0595	1.5
NOL	0.9414	0.7574	6.2	0.9355	0.9325	0.1
ACCRUALS	-0.0844	-0.0830	-0.9	-0.0844	-0.0842	-0.1
MA_SCORE	0.0083	-0.0123	16.9	0.0077	0.0089	-1.0
SIZE	5.6362	5.5985	1.7	5.6323	5.6561	-1.0

Notes: This table reports covariate balance before and after propensity score matching. Bias (%) represents the standardised mean difference between treated and control groups. The results show that covariate imbalance is substantially reduced after matching, with all post-matching bias values falling well below the conventional threshold of 10%, indicating a high degree of balance between the two groups.

Furthermore, all covariates exhibit standardised differences well below the conventional threshold of 10% after matching, suggesting that the matching procedure effectively balances observable characteristics between treated and control firms. Consistent with this, Rubin's B statistic decreases from 51.5 to 5.8, and Rubin's R statistic falls within the acceptable range, further confirming the quality of the matching process.

In addition, the common support condition is satisfied, as sufficient overlap is observed in the distribution of propensity scores between treated and control firms, indicating that the matching procedure is not driven by extrapolation. Overall, these results indicate that the matching procedure successfully achieves covariate balance, thereby enhancing the credibility of the estimated treatment effects.

2.6 Additional Robustness Analysis

2.6.1 Analysis Using Observed Benchmark Years (1990, 2000, 2007)

As a robustness check, we re-estimate our main models using only the benchmark years (1990, 2000, and 2007), for which CreativeShare data are directly observed. This approach follows Ucar (2018) and allows us to assess whether our findings are sensitive to the use of interpolated values. By restricting the sample to these observed years, we mitigate potential concerns related to measurement error arising from the interpolation procedure.

The results remain consistent with our baseline findings in terms of both the sign and statistical significance of the coefficients. This provides additional confidence that our main results are not driven by the interpolation of the CreativeShare variable but rather reflect a robust relationship between local creative culture and corporate tax avoidance.

Table 2-8: Analysis Based on Observed Benchmark Years (1990, 2000, 2007)

	(1) CETR	(2) CETR
CSHARE	-0.134***	-0.124*
	(0.042)	(0.066)
MTB	-	-0.001**
		(0.001)
LEV	-	-0.014
		(0.009)
FI	-	0.236
		(0.149)
PPE	-	-0.049**
		(0.021)
INTAN	-	-0.002
		(0.017)
EQUITY	-	0.547
		(1.036)
RD	-	-0.266***
		(0.047)
ROA	-	0.029**
		(0.012)
CNOL	-	-0.018**
		(0.008)
NOL	-	0.002
		(0.001)
ACCRUALS	-	0.015*
		(0.009)
MA_SCORE	-	-0.013
		(0.038)
SIZE	-	0.010***
		(0.002)
_cons	0.261***	0.251***
	(0.013)	(0.024)
R^2	0.061	0.125
F	10.129	14.846
N	5424	2380

Notes: This table presents regression results of the main analysis using only the observed benchmark years (1990, 2000, and 2007), for which CreativeShare data are directly available. Columns (1) and (2) present the results for the effect of local creative culture on tax avoidance (Hypothesis 1). All variables are defined in the Appendix. Standard errors are reported in parentheses with standard errors clustered by firm and year. ***, **, * indicate significance at 1%, 5%, and 10% levels, respectively.

2.6.2 Alternative Measure of Tax Avoidance

To ensure the robustness of our findings for both the first and second hypotheses, we test whether the relationship between local creative culture and corporate tax avoidance remains consistent using an alternative measure of tax avoidance: Book Effective Tax Rate (ETR).

Unlike CETR, ETR captures a firm's accrual-based tax burden, reflecting tax avoidance strategies that result in permanent book-tax differences, as outlined by Dyreng et al. (2010).

In this context, ETR is calculated as the ratio of total tax expense over the most recent five years, scaled by total pre-tax income net of total special items over the same period. This accounts for permanent tax avoidance strategies, such as investments in municipal bonds or participation in tax shelters. As presented in **Table 2-9**, the results using ETR as a dependent variable across the three columns are consistent with those reported in **Table 2-4**, further reinforcing the robustness of our main findings.

Table 2-9: ETR as an Alternative Measure of Tax Avoidance

	(1) **Dependent variable = ETR**	**(2)** **Dependent variable = ETR**
CSHARE	-0.114***	-0.125***
	(0.018)	(0.018)
MTB	-	-0.001***
		(0.000)
LEV	-	-0.030***
		(0.004)
FI	-	-0.034
		(0.038)
PPE	-	0.015**
		(0.007)
INTAN	-	0.015**
		(0.006)
EQUITY	-	0.984***
		(0.308)
ROA	-	0.137***
		(0.006)
CNOL	-	0.006
		(0.004)
NOL	-	-0.005***
		(0.000)
ACCRUALS	-	0.024***
		(0.009)
MA_SCORE	-	-0.007
		(0.009)
SIZE	-	0.009***
		(0.001)
_cons	0.280***	0.237***
	(0.006)	(0.007)
Industry fixed effect	Included	Included
Year fixed effect	Included	Included
Adj. R^2	0.056	0.133
N	31686	31686

Notes: This table presents regression results of the main analysis using ETR as a robustness measure for corporate tax avoidance. Columns (1) and (2) present the results for the effect of local creative culture on tax avoidance (Hypothesis 1). All variables are defined in the Appendix. Standard errors are reported in parentheses with standard errors clustered by firm and year. ***, **, * indicate significance at 1%, 5%, and 10% levels, respectively.

2.6.3 A Different Measure of Uncertainty

To verify the robustness of our second hypothesis results, we examine whether the moderating role of uncertainty on the relationship between local creative culture and corporate tax avoidance remains intact when we replace the measurement of uncertainty with dummy variables, where 1 indicates a percentage point above the median and 0 indicates otherwise. **Table 2-10** shows that the results are similar to those previously reported and displayed in **Table 2-4**. This specification allows us to assess whether the moderating effect of uncertainty persists in a more simplified framework that distinguishes only between environments with high and low uncertainty. This offers two key advantages. First, it reduces potential concerns about outlier influence or scaling issues in the continuous uncertainty measure. Second, it provides a more intuitive interpretation of the interaction effect between creative culture and uncertainty: we now test whether the impact of creative culture on tax avoidance is systemically different across high- and low-uncertainty contexts.

As shown in **Table 2-10**, the coefficient on the interaction term between CSHARE (our proxy for creative culture) and Uncertainty_ Dummy remains negative and statistically significant (-0.090, $p < 0.05$), consistent with the results reported in **Table 2-4**. This confirms that the mitigating effect of creative culture on tax avoidance is stronger when tax uncertainty is high, reinforcing our hypothesis that creativity enables firms to navigate uncertain regulatory environments more aggressively through tax planning. The direction and significance of the main variables also remain stable, indicating that our results are not sensitive to how uncertainty is operationalized.

Table 2-10: Uncertainty as Dummy Variables

	(1)
	CETR
CSHARE	-0.081**
	(0.040)
Uncertainty_ Dummy	0.053***
	(0.013)
CSHARE * Uncertainty_ Dummy	-0.090**
	(0.043)
MTB	-0.001***
	(0.000)
LEV	-0.021***
	(0.003)
FI	0.033
	(0.036)
PPE	-0.094***
	(0.005)

INTAN	-0.036***
	(0.005)
EQUITY	1.145***
	(0.274)
RD	-0.294***
	(0.014)
ROA	0.082***
	(0.005)
CNOL	0.008***
	(0.003)
NOL	-0.005***
	(0.000)
ACCRUALS	-0.005
MA_SCORE	0.006
	(0.010)
SIZE	0.004***
	(0.001)
_cons	0.253***
	(0.013)
R^2	0.093
F	212.134
N	33011

Notes: Table 2-10 uses different measures of Uncertainty. Column (1) reports the results from OLS regressions of the association between creative culture and tax avoidance moderated by tax uncertainty (Uncertainty). Tax uncertainty here is a dummy variable. The results are consistent with our findings in Table 2-4 (our main model for H2). We use CETR as a dependent variable. Standard errors are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Refer to the Appendix for the variable definitions.

2.7 Further Analysis

2.7.1 Different Levels of Local Creative Culture

As an additional analysis and following Ucar (2018), we utilise local creative culture as a dummy variable (CSHARE), set to 1 if it scores greater than the sample average and 0 otherwise. This dummy measure addresses a threshold point of evaluation rather than a continuous scale. In **Table 2-11**, we test whether the location of headquarters affects the relationship between creative culture and tax avoidance. If firms in counties with a higher proportion of the population involved in creative work engage in more tax avoidance practices, then firms changing headquarters from lower to higher creative culture counties would pay lesser tax expenditure. We find the coefficients on this variable CSHARE to be negative and significant at p < 0.05. According to this result, firms located in countries with higher creative cultures do indeed engage in more tax avoidance activities than firms located in countries with lower creative cultures.

Table 2-11: **Different Levels of LCC**

Variables	**(1) Higher CSHARE CETR**	**(2) Lower CSHARE CETR**
CSHARE	-0.149***	-0.277***
	(0.033)	(0.057)

MTB	-0.001***	-0.001***
	(0.000)	(0.000)
LEV	-0.019***	-0.035***
	(0.005)	(0.005)
FI	0.014	0.218***
	(0.046)	(0.060)
PPE	-0.057***	-0.067***
	(0.009)	(0.008)
INTAN	-0.015**	-0.007
	(0.007)	(0.008)
EQUITY	1.168***	0.957***
	(0.406)	(0.361)
RD	-0.246***	-0.176***
	(0.018)	(0.025)
ROA	0.063***	0.063***
	(0.008)	(0.008)
CNOL	0.002	0.003
	(0.004)	(0.004)
NOL	-0.002***	-0.003***
	(0.001)	(0.001)
ACCRUALS	-0.018**	-0.009
	(0.008)	(0.008)
MA SCORE	-0.012	-0.014
	(0.013)	(0.014)
SIZE	0.011***	0.009***
	(0.001)	(0.001)
_cons	0.287***	0.269***
	(0.037)	(0.032)
N	16673	16338

Notes: Columns (1) and (2) report the results from OLS regressions of the association between local creative culture and tax avoidance in high and low local creative cultures. Standard errors are in parentheses and are clustered by firm. * p < 0.1, ** p < 0.05, *** p < 0.01. Refer to the Appendix for the variable definitions.

To assess the economic significance of these results, we multiply the coefficient estimates on creative culture of -0.149 in Column (1) by our sample standard deviation of CSHARE of 0.068 (see Table statistics summary). These results indicate that a one standard deviation increase in creative culture is associated with a decrease of -1.01% in tax avoidance in high creative culture. In addition, we multiply the coefficient estimates on CSHARE of -0.277 in Column (2) by our sample standard deviation of creative culture of -1.88 (see Table statistics summary). These results indicate that a one standard deviation increase in creative culture is associated with a decrease of almost 2% in tax avoidance in low creative culture (CSHARE).

2.7.2 The Influence of Other Local Cultural Factors: Religion and Social Capital

As an extension of our primary analysis, we conduct an exploratory examination incorporating the interaction variables for religious adherence (RELIG) and social capital (Soc Capital) to investigate their potential influence on the association between local creative culture and tax

avoidance. Our hypothesis posits that firms located in regions characterised by both a flourishing culture of innovation and substantial levels of social capital are likely to exhibit lower levels of tax avoidance than firms operating within creative environments that lack such social and cultural resources.

Furthermore, we anticipate that firms situated in areas with a high degree of religious orientation may display differing propensities towards tax avoidance, regardless of the prevailing level of creative culture. This expectation is grounded in the notion that strong civic norms and moral expectations surrounding tax compliance—particularly in communities with elevated levels of religiosity and social capital—serve to discourage tax avoidance. Individuals residing in such communities are more likely to perceive tax avoidance as inconsistent with civic responsibility and cooperative social behaviour (Hasan et al., 2017).

Previous research supports this view. Managers of corporations headquartered in communities with high levels of social capital are expected to face greater psychic costs (Erard & Feinstein, 1994) and stronger social sanctions (Coleman, 1988) for engaging in tax avoidance than their counterparts based in communities with weaker social capital. According to Hasan et al. (2017), the negative association between social capital and tax avoidance suggests that the social context a corporate headquarters finds itself in plays a meaningful role in shaping its tax-related decisions.

In our study, this interpretation implies that for geographically diversified firms, headquartered in regions characterised by both a highly creative environment and elevated levels of social capital, the positive association between tax avoidance and CSHARE could be significantly attenuated. This finding would indicate that the presence of strong social and ethical norms within the local community may moderate the relationship between creative culture and corporate tax behaviour, thereby constraining firms' engagement in aggressive tax avoidance practices.

$$\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ CSHARE_{i,t} + Soc\ Capital_{i,t} + Soc\ Capital_{i,t} * CSHARE_{i,t} + Control\ variables_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$$

$$\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ CSHARE\ C_{i,t} + Soc\ Capital\ C_{i,t} + Soc\ Capital\ C_{i,t} * CSHARE\ C_{i,t} + Control\ variables_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$$

According to Hilary and Hui (2009), local religiosity has a significant influence on firms' risk exposure, return on assets, investment levels, and R&D activity. They argue that local religion

plays a crucial role in shaping corporate risk-taking behaviour. We thus explore this possibility by incorporating local religiosity as a moderator variable in our analysis. Data on local religiosity were obtained following Boone et al. (2013), derived from surveys conducted by the Association of Religion Data Archives (ARDA)[5]. The variable Religious Adherence (RELIG) is defined as the proportion of a county's population that reports affiliation with an organised religion in a given year, as documented in the ARDA survey[6].

$$\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ CSHARE_{i,t} + RELIG_{i,t} + RELIG_{i,t} * CSHARE_{i,t} + Control\ variables_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$$

$$\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ CSHARE\ C_{i,t} + RELIG\ C_{i,t} + RELIG\ C_{i,t} * CSHARE\ C_{i,t} + Control\ variables_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$$

Table 2-12 presents the main regression results after incorporating additional control variables (Columns 3 and 4). The dependent variable in the models is CETR, which serves as a proxy for corporate tax avoidance, while the primary explanatory variable of interest is CSHARE. In these models, we further include RELIG and Soc Capital as additional control variables.

Controlling for religion and social capital enhances our understanding of the relationship between tax avoidance and creative culture. Religion, as both a cultural and social institution, may shape individuals' ethical beliefs and attitudes towards taxation. By including measures of religiosity in the analysis, we account for the potential influence of religious values on tax avoidance behaviour. Prior research demonstrates that religiosity at the local (county) level affects cultural norms and managerial decision-making, even among individuals who are not personally religious (Hilary & Hui, 2009; Kumar et al., 2011). Moreover, earlier studies suggest that religiosity exerts a constraining influence on tax avoidance by both corporations and individual taxpayers (Boone et al., 2013).

Social capital, by contrast, reflects the network of social relationships, trust, and shared norms within a community or organisation. It plays a crucial role in shaping individuals' behaviour and decision-making processes, including their attitudes towards tax compliance. Existing studies report that individuals across different social environments exhibit varying levels of tax "morale"—that is, the intrinsic motivation to pay taxes (Alm & Torgler, 2006)—and corresponding differences in tax compliance (Alm et al., 1994; Cummings et al., 2009). Furthermore, managerial behaviour, which influences corporate decision-making (Bertrand &

[5] https://www.thearda.com

[6] We use the interpolations of the Census or ARDA data to construct the local variables for years without available data.

Schoar, 2003), including tax-related choices (Dyreng et al., 2010), is itself shaped by the social context of corporate headquarters—through networks such as neighbours, professional associations, and religious communities (Hilary & Hui, 2009; McGuire et al., 2012). Consequently, social capital is likely to be naturally linked to corporate tax avoidance through the influence of civic norms and community expectations.

By controlling for both religion and social capital, we can more accurately assess whether the observed relationship between creative culture and tax avoidance is independent of these social and moral influences. Including these variables in the regression model enables a clearer estimation of the specific impact of creative culture on corporate tax behaviour while accounting for any potential confounding effects from local religiosity and social trust.

Table 2-12: Interaction of Social Capital and Religion

	(1) CETR	(2) CETR	(3) CETR	(4) CETR
CSHARE	-0.137***	-0.207***	-0.128***	-0.120***
	(0.018)	(0.018)	(0.033)	(0.033)
Soc Capital	0.025***	-	0.007	-
	(0.001)		(0.005)	
CSHARE * Soc Capital	-0.042***	-	-	-
	(0.012)			
RELIG	-	-0.098***	-	0.035*
		(0.008)		(0.019)
CSHARE * RELIG	-	1.252***	-	-
		(0.113)		
MTB	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
LEV	-0.026***	-0.022***	-0.028***	-0.028***
	(0.003)	(0.003)	(0.005)	(0.005)
FI	0.091**	0.048	0.092*	0.089
	(0.036)	(0.036)	(0.055)	(0.054)
PPE	-0.105***	-0.097***	-0.064***	-0.065***
	(0.005)	(0.005)	(0.010)	(0.010)
INTAN	-0.021***	-0.035***	-0.010	-0.010
	(0.005)	(0.005)	(0.008)	(0.008)
EQUITY	1.140***	1.229***	1.063***	1.049***
	(0.271)	(0.273)	(0.386)	(0.384)
RD	-0.283***	-0.287***	-0.226***	-0.224***
	(0.013)	(0.014)	(0.021)	(0.021)
ROA	0.075***	0.083***	0.064***	0.064***
	(0.005)	(0.005)	(0.006)	(0.006)
CNOL	0.006**	0.008***	0.003	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
NOL	-0.003***	-0.005***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.001)	(0.001)
ACCRUALS	-0.011*	-0.007	-0.014**	-0.014**
	(0.006)	(0.006)	(0.007)	(0.007)
MA_SCORE	-0.009	0.006	-0.009	-0.008
	(0.009)	(0.010)	(0.013)	(0.013)
SIZE	0.008***	0.005***	0.010***	0.010***

	(0.001)	(0.001)	(0.001)	(0.001)
_cons	0.234***	0.249***	0.243***	0.219***
	(0.004)	(0.004)	(0.013)	(0.016)
R^2	0.118	0.100	0.146	0.146
F	273.927	227.964	56.097	56.811
N	32917	33011	32917	33011

Note: This table reports the results from OLS regressions of the association between local creative culture and tax avoidance moderated by social capital and religiosity. Column (1) reports the moderating effect of social capital (Soc Capital) while Column (2) reports the moderating effect of religious adherence (RELIG). Columns (3) and (4) report the effect of controlling for Soc Capital and RELIG, respectively. Standard errors are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are clustered by firm. Definitions of variables are presented in the Appendix.

The results reported in **Table 2-12** provide additional insight into how other local cultural factors—namely social capital and religion—interact with local creative culture in shaping corporate tax avoidance. In Column (1), the coefficient on CSHARE remains negative and statistically significant, while the interaction term between CSHARE and social capital is also negative and significant. Given that higher CETR reflects lower tax avoidance, this result suggests that social capital strengthens the negative association between local creative culture and tax avoidance, implying that firms located in areas characterised by both high creative culture and strong social capital tend to exhibit lower levels of tax avoidance.

In Column (2), the interaction between CSHARE and religiosity is positive and statistically significant. This indicates that religion moderates the relationship in the opposite direction, weakening the negative association between creative culture and CETR, and therefore increasing tax avoidance. This finding suggests that religiosity may alter how creative environments influence corporate behaviour, potentially by shifting the balance between risk-taking and conformity to prevailing social norms.

Columns (3) and (4), which include social capital and religion as control variables, further confirm the robustness of the main results, as the coefficient on CSHARE remains negative and statistically significant across specifications. Overall, these findings support the argument that local cultural factors play an important moderating role in shaping corporate tax behaviour, with social capital reinforcing compliance-oriented behaviour, while religiosity introduces a more nuanced and context-dependent effect.

2.7.3 The Influence of CEO Characteristics

As **Table 2-13** shows, we incorporate several additional control variables into our empirical model in order to enhance its robustness and provide a more comprehensive analysis of the relationship between local creative culture and tax avoidance, including factors influencing firms' decisions. One key aspect we consider is the influence of the Chief Executive Officer (CEO). Corporate decisions, such as tax avoidance strategies, are strongly influenced by the

characteristics of the CEO, including their age (AGE), gender (Gender), and length of tenure (Tenure) (Cain & Mckeon, 2016; Hsieh et al., 2018; Araújo et al., 2021). CEO tenure is typically defined as the number of years the CEO has served in their current position, which reflects their experience, influence within the firm, and accumulated firm-specific knowledge (Cain & McKeon, 2016). To gain a deeper understanding of how local creative culture influences tax avoidance practices, it is essential to consider such wider variables[7].

Table 2-13: The Influence of CEO Age, Gender, and Tenure

	(1) CETR	(2) ETR	(3) CETR	(4) ETR	(5) CETR	(6) ETR	(7) CETR	(8) ETR
CSHARE	-0.068***	-0.055**	-0.256***	-0.165***	-0.085***	-0.099***	-0.081***	-0.056**
	(0.026)	(0.027)	(0.040)	(0.041)	(0.027)	(0.028)	(0.026)	(0.027)
AGE	0.002***	0.001**	0.003***	0.002***				
	(0.000)	(0.000)	(0.001)	(0.001)				
Gender	-0.003	0.002			0.017	0.040**		
	(0.010)	(0.011)	-	-	(0.020)	(0.020)	-	-
Tenure	-0.000	0.000					0.001*	0.001
	(0.000)	(0.000)	-	-	-	-	(0.000)	(0.000)
MTB	0.000	0.001**	-0.000	0.000	-0.000	0.000	-0.000	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LEV	-0.053***	-0.033***	-0.044***	-0.029***	-0.043***	-0.029***	-0.049***	-0.032***
	(0.007)	(0.008)	(0.006)	(0.006)	(0.005)	(0.006)	(0.007)	(0.007)
FI	-0.120**	-0.193***	-0.141***	-0.171***	-0.152***	-0.186***	-0.130**	-0.205***
	(0.051)	(0.051)	(0.043)	(0.043)	(0.041)	(0.041)	(0.051)	(0.050)
PPE	-0.076***	0.037***	-0.065***	0.027***	-0.066***	0.028***	-0.074***	0.037***
	(0.010)	(0.011)	(0.009)	(0.009)	(0.008)	(0.009)	(0.010)	(0.010)
INTAN	0.008	0.025***	0.005	0.017**	0.001	0.015**	0.003	0.022***
	(0.008)	(0.009)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)
EQUITY	0.771*	0.261	0.594	-0.004	0.773**	0.116	0.866**	0.309
	(0.446)	(0.452)	(0.396)	(0.403)	(0.366)	(0.373)	(0.433)	(0.438)
RD	-0.284***	-0.211***	-0.297***	-0.209***	-0.319***	-0.197***	-0.306***	-0.198***
	(0.041)	(0.036)	(0.035)	(0.027)	(0.034)	(0.026)	(0.041)	(0.035)
ROA	0.087***	0.140***	0.091***	0.154***	0.091***	0.163***	0.085***	0.148***
	(0.018)	(0.018)	(0.014)	(0.015)	(0.013)	(0.014)	(0.017)	(0.018)
CNOL	0.002	0.011	0.012	0.020***	0.012	0.020***	0.002	0.012
	(0.012)	(0.010)	(0.009)	(0.008)	(0.008)	(0.007)	(0.011)	(0.010)
NOL	-0.012***	-0.012***	-0.015***	-0.012***	-0.016***	-0.013***	-0.012***	-0.012***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.005)	(0.004)
ACCRUALS	0.072***	0.090***	0.071***	0.097***	0.066***	0.091***	0.068***	0.088***
	(0.023)	(0.024)	(0.020)	(0.020)	(0.018)	(0.019)	(0.022)	(0.023)
MA_SCORE	-0.031***	-0.005	-0.028**	-0.007	-0.030***	-0.011	-0.037***	-0.014
	(0.012)	(0.013)	(0.011)	(0.012)	(0.010)	(0.011)	(0.012)	(0.013)

[7] We did not add these variables in our main regression because doing so reduces the sample.

SIZE	-0.001	0.000	-0.000	0.002	0.001	0.002**	-0.000	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
_cons	0.224***	0.251***	0.297***	0.276***	0.296***	0.268***	0.308***	0.278***
	(0.020)	(0.021)	(0.012)	(0.012)	(0.011)	(0.011)	(0.014)	(0.014)
R^2	0.156	0.134	0.143	0.136	0.140	0.133	0.149	0.132
F	24.768	22.190	31.508	43.595	29.336	45.463	22.891	25.730
N	9676	10186	13537	14455	14957	15967	10425	10992

Notes: This table reports the results from OLS regressions of the association between local creative culture and tax avoidance after controlling for three different characteristics of CEO, namely age (AGE), gender (Gender), and tenure (Tenure). Columns (1) and (2) report the effect of controlling for these by using different measures of tax avoidance (CETR and ETR, respectively). Columns (3), (4), (5), (6), (7), and (8) show the moderating effect of these three characteristics, respectively, in the association between local creative culture and tax avoidance using different measures of tax avoidance (CETR and ETR, respectively). Standard errors are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are clustered by firm. Definitions of variables are presented in the Appendix.

Using CEO-related variables, namely their age, gender, and tenure, we examine the robustness of the previously observed positive relationship between local creative culture and tax avoidance after incorporating these into our regression model. We find that local creative culture is positively associated with tax avoidance practices, which is indeed consistent with our main regressions. Despite the influence of CEOs' particular characteristics, creative culture continues to affect firms' tax avoidance decisions, even when this senior and dominant role is taken into account. These findings cannot find exception to a vibrant local creative culture directly fostering greater tax-planning innovation, and we conclude that creative culture does exert significant influence on tax avoidance, regardless of CEO-related factors.

Additionally, we extend our investigation by introducing the CEO as a moderating variable in the relationship between local creative culture and tax avoidance. Despite this additional complexity in the model, the results continue to validate the strong and positive relationship observed in our initial analyses. This suggests that the influence of local creative culture on tax avoidance remains consistently favourable, and even when accounting for the moderating role of CEOs, we find that creative culture continues to foster a tax environment conducive to innovative tax planning strategies.

2.7.4 The Influence of Financial Constraint

Recent research has highlighted the significant influence of financial constraint on corporate tax avoidance. For example, Edwards et al. (2016) find that financially constrained firms tend to increase their internal funds by engaging in tax planning strategies, noting that they save substantial amounts through tax deferrals. Similarly, Law and Mills (2015) conclude that firms facing financial constraints are better able to identify and implement difficult-to-quantify aggressive tax planning activities.

Given the empirical evidence provided by these studies, it is reasonable to expect that financial constraints influence the relationship between local creative culture and corporate tax avoidance. Firms located in regions characterised by strong creative cultures may adopt tax avoidance strategies differently depending on their financial circumstances.

One possible mechanism through which financial constraints may affect this relationship is by amplifying the positive effect of creative culture on tax avoidance. Firms experiencing such limitations may perceive tax avoidance as a practical means of alleviating financial pressure and improving liquidity. In such circumstances, a strong creative culture may foster innovation and resourcefulness, encouraging firms to devise sophisticated tax avoidance strategies to address their financial challenges. Conversely, financial constraints may also weaken the relationship between creative culture and tax avoidance. Severely constrained firms may prioritise financial stability and regulatory compliance over aggressive tax planning. In such situations, the positive influence of creative culture on tax avoidance may be diminished, as firms adopt a more conservative approach that reflects financial prudence and risk aversion.

Accordingly, we hypothesise that financial constraint moderates the association between local creative culture and corporate tax avoidance.

We define and measure financial constraint using the SA (size-age) index, following Whited and Wu (2006) and Hadlock and Pierce (2010), who explain how the index is calculated from a firm's total assets and age, with higher values indicating greater financial constraint. A detailed explanation of the SA index construction is provided in the Appendix. We then incorporate financial constraint as a determinant of tax avoidance, consistent with the findings of Law and Mills (2015) and Edwards et al. (2016), who identify such constraints as a key driver of tax avoidance behaviour. Furthermore, we employ financial constraint (SA_index) as an interaction variable to examine its moderating effect on CSHARE, and as a control variable to assess its influence on the main results of our analysis.

As hypothesised, our initial assumption proposed a consistent relationship between local creative culture and tax avoidance activities, independent of any moderating factors. However, the results from our extended model incorporating the interaction term indicate that this relationship is, in fact, contingent upon the level of financial constraint. Importantly, the inclusion of the interaction term enhances our understanding of the determinants of tax avoidance, offering deeper insights into the respective roles of local creative culture and financial constraint rather than diminishing their individual effects.

As presented in **Table 2-14** in Columns (1) and (2), financial constraint exerts a statistically significant moderating effect on the relationship between creativity and tax avoidance. The negative coefficient and significant t-value associated with financial constraint indicate that higher levels of financial constraint are positively associated with increased tax avoidance. These findings suggest that financially constrained firms are more likely to engage in tax avoidance strategies as a means of mitigating their financial limitations.

Furthermore, the results of the regression analysis reveal that the relationship between tax expenditure (CETR) and local creative culture remains negative in both models. This implies that firms situated in regions with stronger creative cultures tend to exhibit higher levels of tax avoidance, reinforcing the hypothesised link between creativity, financial adaptability, and strategic tax behaviour.

Table 2-14: The Influence of Financial Constraint

	(1) CETR	(2) CETR
CSHARE	-0.118***	-0.170***
	(0.032)	(0.019)
SA_ index	-0.041***	-0.034***
	(0.005)	(0.003)
CSHARE * SA_ index	-	-0.059***
		(0.021)
MTB	-0.001***	-0.001***
	(0.000)	(0.000)
LEV	-0.023***	-0.016***
	(0.005)	(0.003)
FI	0.080	0.027
	(0.054)	(0.036)
PPE	-0.067***	-0.093***
	(0.009)	(0.005)
INTAN	-0.009	-0.038***
	(0.007)	(0.005)
EQUITY	1.043***	1.197***
	(0.379)	(0.274)
RD	-0.227***	-0.290***
	(0.021)	(0.014)
ROA	0.052***	0.074***
	(0.006)	(0.006)
CNOL	0.002	0.008***
	(0.003)	(0.003)
NOL	-0.002***	-0.005***
	(0.001)	(0.000)
ACCRUALS	-0.017**	-0.007
	(0.007)	(0.006)
MA_SCORE	0.011	0.026***
	(0.014)	(0.010)
SIZE	-0.002	-0.007***
	(0.002)	(0.001)
Cons	0.157***	0.294***

	(0.016)	(0.005)
R^2	0.151	0.095
F	65.730	216.836
N	33011	33011

Notes: Columns (5) and (6) report the results from OLS regressions of the association between creative culture and tax avoidance moderated by financial constraint (SA_ index). Column (5) uses financial constraint as a control variable in the main model. Column (6) uses financial constraint as a moderator variable. Standard errors are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors are clustered by firm. Definitions of variables are presented in the Appendix.

Ultimately, the results of the regression analysis align with the expectation that higher financial constraints strengthen the positive association between local creative culture and tax avoidance. This correspondence arises from the understanding that greater financial constraints typically motivate firms to engage in tax avoidance strategies.

A recent study by Edwards et al. (2016) supports this interpretation, suggesting that financially constrained firms are more inclined to avoid taxes. They demonstrate that such companies utilise tax savings to finance investments and settle current liabilities. These findings reinforce the notion that financial limitations encourage firms to adopt tax avoidance strategies as a means of enhancing liquidity and sustaining operational flexibility.

2.8 How Does Local Creative Culture Impact Corporate Culture

In this section, we conduct an empirical examination of the impact of local creative culture on firm-level creativity. Our objective is to determine whether the observed association between tax avoidance and local creative culture is primarily attributable to the influence of the prevailing creative environment within a specific geographical area, rather than the intrinsic creativity of individual firms.

To address this question, we introduce a firm-level culture variable, as reported in **Table 2-15**, using a reduced sample comprising 21,163 firm-year observations. The aim of this analysis is to evaluate the extent to which local creative culture affects the specific creative culture manifest in individual firms. Further, as an alternative measure of firm-level creative culture, we employ patent data obtained from the University of Virginia, which reduces the sample to 13,437 firm-year observations.

The results presented in **Table 2-15** reveal a positive and statistically significant relationship between local creative culture and firm-level creative culture. This finding indicates that the creative environment of a locality exerts a strong influence on the innovative and creative orientation of firms operating within it.

Consequently, we infer that the relationship between tax avoidance and innovation may be predominantly driven by the broader creative culture of the locality, which has a positive and significant impact on firms' internal creative orientation. In light of this finding, the documented association between tax avoidance and local creative culture thus far may now be interpreted with some caution, as it may be mediated by the influence of the broader regional creative environment rather than solely by the inherent creative capacity of individual firms.

Table 2-15: The Influence of LCC in Corporate Culture

Variables	**(1)** **Innovation**	**(2)** **Patent**
CSHARE	5.474***	60.474***
	(0.623)	(7.175)
MTB	0.024***	0.164***
	(0.004)	(0.063)
LEV	-0.406***	-3.613**
	(0.107)	(1.440)
FI	0.020	101.416***
	(1.088)	(11.421)
PPE	-0.940***	-1.592
	(0.179)	(2.819)
INTAN	0.448***	-2.357
	(0.132)	(1.970)
EQUITY	-20.025***	413.483***
	(6.874)	(102.606)
RD	2.910***	21.226***
	(0.404)	(4.203)
ROA	0.044	-14.595***
	(0.164)	(2.084)
CNOL	0.218***	0.625
	(0.060)	(0.948)
NOL	-0.005	1.751***
	(0.015)	(0.176)
ACCRUALS	-1.128***	-6.802***
	(0.153)	(2.015)
MA_SCORE	1.320***	42.032***
	(0.259)	(3.194)
SIZE	0.109***	15.715***
	(0.026)	(0.261)
_cons	2.487***	-96.166***
	(0.264)	(2.817)
R^2	0.364	0.327
F	27.152	391.524
N	21163	13437

Notes: Column (1) reports the results from OLS regressions of the association between local creative culture and firm-level innovation (Innovation). Robust t-statistics are in brackets and are based on standard errors that are clustered by firm. Column (2) reports the results from OLS regressions of the association between local creative culture and patent activity (Patent). Robust t-statistics are in brackets and based on standard errors clustered by firm. ***p < 0.01, **p < 0.05, *p < 0.10. Refer to the Appendix for the variable definitions.

2.8.1 Local Creative Culture and Firm-Level Creativity

In **Table 2-16**, we select two distinct samples: one comprising companies situated in regions characterised by a higher local creative culture, and the other with companies in regions with a comparatively lower level of local creative culture. The objective of this sampling strategy was to examine the influence of the environmental context on the creative culture of companies, specifically its impact on various particular dimensions associated with creativity.

According to our findings, creative attributes exhibited by companies are significantly influenced by the local creative culture. Specifically, companies situated in an area with a higher level of creative culture demonstrated a significantly higher degree of creativity compared to their counterparts located in regions with less pronounced creative culture. Hence, we argue that the relationship between local creative culture and tax avoidance may be primarily determined by the broader prevailing cultural milieu rather than by firm-level creativity. These findings contribute to our deepening understanding of the complex dynamics between the local creative culture and the creative behaviour of companies, suggesting that the environmental context in which a company operates plays a crucial role in shaping its creative culture and associated expressions. Overall, these findings highlight the importance of contextual factors in understanding the interplay between local creative culture, company-level creative culture, and tax avoidance. We emphasise the importance of considering the broader cultural context when analysing the dynamics of creativity and its implications for corporate behaviour and decision-making.

Table 2-16: The Influence of Different Levels of LCC in Corporate Culture

	(1) Higher LCC Innovation	(2) Lower LCC Innovation	(3) Higher LCC Patent	(4) Lower LCC Patent
CSHARE	4.884***	4.840***	63.228***	66.648***
	(0.485)	(0.879)	(13.376)	(23.738)
MTB	0.028***	0.010***	0.153**	0.218**
	(0.003)	(0.003)	(0.077)	(0.108)
LEV	-0.471***	-0.259***	-6.617***	1.645
	(0.076)	(0.079)	(1.871)	(2.215)
FI	-0.143	-0.436	130.133***	-0.955
	(0.594)	(0.732)	(14.128)	(19.382)
PPE	-1.162***	-0.756***	4.143	-8.039**
	(0.135)	(0.112)	(3.906)	(3.977)
INTAN	0.246***	0.746***	-2.098	-5.455*
	(0.091)	(0.102)	(2.459)	(3.284)
EQUITY	-26.273***	-13.610***	20.322	921.189***
	(6.488)	(4.994)	(150.883)	(135.551)

RD	2.625***	3.799***	28.853***	14.848*
	(0.245)	(0.381)	(5.029)	(8.289)
ROA	0.078	-0.091	-14.019***	-14.806***
	(0.129)	(0.150)	(2.593)	(3.497)
CNOL	0.237***	0.091	0.044	2.222
	(0.054)	(0.075)	(1.133)	(1.743)
NOL	-0.010	0.014	2.348***	1.127***
	(0.010)	(0.014)	(0.222)	(0.288)
ACCRUALS	-1.130***	-0.745***	-4.143*	-7.799**
	(0.138)	(0.160)	(2.489)	(3.424)
MA SCORE	0.976***	1.282***	39.762***	46.939***
	(0.155)	(0.175)	(3.970)	(5.410)
SIZE	0.103***	0.074***	18.057***	12.667***
	(0.015)	(0.015)	(0.356)	(0.376)
_cons	1.332***	1.574**	3.527	-65.340***
	(0.438)	(0.686)	(11.812)	(13.117)
N	12518	8646	8460	4978

Notes: Columns (1) and (2) report the results from OLS regressions of the association between local creative culture and firm level of innovation in high and low local creative cultures. Robust t-statistics are in brackets and are based on standard errors that are clustered by firm. Columns (3) and (4) of this table report the results from OLS regressions of the association between local creative culture and patent activity in high and low local creative cultures. Robust t-statistics are in brackets and are based on standard errors that are clustered by firm. ***p < 0.01, **p < 0.05, *p < 0.10. Refer to the Appendix for variable definitions.

2.9 Conclusion

In this study, we conducted an empirical analysis using a large sample of 8,721 U.S.-listed firms spanning 1990 to 2022, to examine the relationship between local creative culture and corporate tax avoidance. The study is motivated by the recognition that the cultural environment a firm's headquarters finds itself in can substantially influence managerial decision-making and corporate behaviour. We focused specifically on creative culture, given its well-documented role in fostering innovation and driving economic growth, while also acknowledging its potential to generate unintended outcomes such as financial misreporting and excessive risk-taking.

Our empirical findings indicate that firms headquartered in U.S. counties with higher levels of local creative culture tend to have lower tax expenditure compared with those in counties characterised by weaker creativity. This result suggests that the presence of a creative culture influences managerial attitudes and practices toward tax planning and avoidance. Further, we examined the moderating effects of tax uncertainty and financial constraints on this relationship. The results reveal that these factors interact significantly with local creative culture, influencing the observed negative association between creative culture and tax expenses. This highlights the contextual conditions under which creative culture affects firms'

tax avoidance behaviour and reinforces the importance of considering firm-specific constraints and environmental uncertainty when analysing tax decisions.

Even after controlling for religion, social capital, and CEO-specific characteristics as potential confounding factors, the positive association between local creative culture and tax avoidance remains robust. Moreover, our analysis of firms that relocated their headquarters from regions with low creative culture to those with high creative culture demonstrated that such relocations are associated with reduced tax expense, further reinforcing our central hypothesis. To address potential endogeneity concerns, we employed both Propensity Score Matching (PSM) and Two-Stage Least Squares (2SLS) regression techniques. The results consistently support the assertion that local creative culture exerts a positive and statistically significant influence on corporate tax avoidance.

From a theoretical perspective, these findings contribute to the literature by highlighting the role of informal institutions—particularly local cultural environments—as important determinants of corporate tax behaviour. Consistent with Institutional Theory, the results suggest that firms adapt their strategies in response to the normative pressures embedded within their local environments, while also aligning with Resource Dependence Theory, which emphasises the role of internal and external constraints in shaping strategic decision-making. By demonstrating that creative culture can both enable and condition tax avoidance behaviour, this study extends prior research that has predominantly focused on formal institutions or firm-level characteristics.

From a practical perspective, the findings offer several implications for policymakers, regulators, and investors. For regulatory authorities such as the IRS, the results suggest that tax enforcement strategies may need to account for local cultural environments, as firms operating in highly creative regions may exhibit distinct tax planning behaviours. For policymakers, the findings highlight the importance of designing policies that balance the promotion of innovation with the need to maintain tax compliance. For investors, understanding the cultural context in which firms operate may provide additional insight into firms' risk profiles and financial strategies, particularly in relation to tax planning and transparency.

While this study offers meaningful insights, we acknowledge certain limitations. First, the analysis is restricted to U.S. firms, and both institutional and societal differences across countries may yield varying relationships between local creative culture and tax avoidance, potentially limiting the generalisability of the findings. Second, although we control for several confounding variables, there may remain unobserved factors that influence the observed

associations. Third, the use of interpolated measures for creative culture may introduce measurement error, despite the robustness checks performed to mitigate this concern.

Despite these limitations, our research contributes to the growing literature on the role of local socio-cultural environments in shaping corporate behaviour. By elucidating the relationship between creative culture and tax avoidance, this study advances the understanding of how socioeconomic and cultural contexts inform managerial decision-making and corporate financial strategy. Future research could extend this analysis to cross-country settings, incorporate alternative measures of informal institutions, and further explore the mechanisms through which cultural environments interact with firm-level characteristics to influence corporate tax behaviour.

Chapter 3

Regulatory Fragmentation and Corporate Tax Avoidance

Chapter 3: Regulatory Fragmentation and Corporate Tax Avoidance

Abstract

This study examines the relationship between regulatory fragmentation and corporate tax avoidance, with a particular focus on whether the presence of multiple regulatory bodies overseeing the same issue influences firms' tax behaviour. Using an extensive, unbalanced dataset comprising 32,348 firm-year observations of U.S.-listed firms from 1995 to 2019, we find a negative relationship between regulatory fragmentation and tax avoidance. Furthermore, we provide evidence of a moderating effect of regulatory intensity, showing that the negative association between regulatory fragmentation and tax avoidance is more pronounced in environments characterised by active and enforcement-oriented regulatory agencies. Our analysis also reveals that internal firm characteristics—including innovation capacity, managerial ability, and financial constraints—shape the magnitude of this relationship, influencing how firms respond to fragmented oversight. In addition, this study highlights the interplay between regulatory fragmentation, tax avoidance, and local cultural factors such as creative culture and religiosity, illustrating that contextual elements further shape corporate tax strategies. By integrating both the moderating role of regulatory intensity—its strength in oversight—and the influence of firm-specific and contextual factors, this research contributes to a deeper understanding of the intersection between regulation and taxation, demonstrating that regulatory design, enforcement dynamics, and organisational characteristics collectively influence corporate tax avoidance decisions.

Keywords: Tax avoidance, corporate tax avoidance, regulatory fragmentation, regulatory

3.1 Introduction

In the evolving landscape of corporate taxation, regulatory fragmentation—namely multiple federal agencies overseeing the same or overlapping policy areas—has emerged as a pivotal factor influencing both investor decisions and firm value. As Michael Porter observed, "Regulation can significantly impact competition in an industry. It can define the rules of the game and alter relative costs and demands. However, unless regulations are clear and stable, they can lead to uncertainty, creating an environment where business decisions are deferred or distorted (Engau & Hoffmann, 2011). The complexity inherent in fragmented regulatory oversight shapes corporate decision-making processes profoundly, leading firms to adopt varied approaches to tax management depending on the degree of regulatory overlap and the divergent mandates of the agencies involved.

Previous research has explored the broad impacts of regulatory environments on corporate behaviour; however, relatively few studies have specifically examined the effects of regulatory fragmentation. For instance, Kalmenovitz et al. (2022) demonstrate that regulatory fragmentation increases operational costs and diminishes firm productivity, profitability, and growth. It also discourages new market entrants and raises the probability of smaller firms exiting the industry. These effects stem from both redundant oversight and, more critically, inconsistencies across government agencies. These findings introduce a novel dimension to the understanding of regulatory burden, showing that the coordination costs associated with inter-agency interactions exacerbate the strain on firms.

Similarly, Nicoletti and Scarpetta (2003) investigate the impact of regulatory burden on entrepreneurial activity and found that a lighter regulatory framework is associated with higher rates of strategic entrepreneurial entry. Their results suggest that excessive regulation can inhibit entrepreneurship, ultimately constraining market dynamism and competitiveness. Complementing these insights, Bertrand and Kramarz (2002) reveal that stringent labour regulations can adversely affect firm performance by elevating labour costs and reducing flexibility. These constraints, in turn, lead to lower productivity and profitability, particularly in industries requiring rapid adaptation to evolving market conditions.

Conversely, a growing stream of literature highlights potentially positive effects of regulatory fragmentation on corporate governance. Some scholars argue that fragmented oversight can strengthen compliance mechanisms and enhance governance standards by subjecting firms to

multiple layers of accountability. For example, Xu (2024) find a positive association between regulatory fragmentation and internal control mechanisms within U.S. firms, challenging prior assumptions of its uniformly negative impact. His findings indicate that regulatory fragmentation reduces the incidence of internal control weaknesses, suggesting that the presence of multiple regulators may reinforce oversight quality and internal compliance. Likewise, Yahaya et al. (2020), in their study of Nigerian banks, report that the coexistence of several regulatory frameworks improved bank performance by promoting more stringent governance practices. These findings imply that, under certain institutional conditions, regulatory fragmentation can contribute positively to corporate governance by fostering stronger accountability, compliance, and monitoring standards.

In the realm of tax avoidance, existing research suggests that regulatory frameworks play a crucial role in shaping corporate tax behaviours, both directly and indirectly. For instance, Kubick and Masli (2016) observe that firms receiving tax-related SEC comment letters subsequently exhibited a decline in tax avoidance activities, attributable to heightened perceptions of tax-related risks and costs. Similarly, Bimo et al. (2019) find that stronger internal control mechanisms, which may arise as a by-product of regulatory fragmentation, significantly reduce the likelihood of tax avoidance. This implies that the negative effect of regulatory fragmentation on tax avoidance may stem from improved governance and compliance systems that discourage aggressive tax practices.

Supporting this view, Alm (1988) proposes that higher compliance costs deter tax avoidance by imposing substantial financial burdens on firms attempting to circumvent tax obligations. Reinforcing this perspective, Lorenz et al. (2023), in their study “The Epidemiology of Tax Avoidance Narratives”, demonstrate that increased compliance costs lead firms to invest fewer resources in tax optimisation, thereby reducing the overall prevalence of tax avoidance. In the same vein, Onoja and Usman (2020) find that elevated compliance costs enhance tax compliance and effectively curtail avoidance practices.

Conversely, regulatory fragmentation could potentially exacerbate corporate tax avoidance, particularly given prior evidence that organisational fragmentation reduces both profitability and productivity. Rinaldi et al. (2023) report that firms with lower profitability are more likely to engage in tax avoidance as a strategic means of conserving resources and enhancing short-term financial performance. Managers may intensify this behaviour, therefore, during periods of declining corporate activity, as suggested by Xu and Zheng (2018), by adopting aggressive

tax planning strategies to offset reduced revenues. When regulatory frameworks overlap and tax codes are ambiguous, opportunities to exploit regulatory loopholes seem more pronounced. In this way, regulatory fragmentation may inadvertently facilitate tax avoidance by providing firms with alternative channels to minimise tax liabilities, partially compensating for efficiency losses from fragmented oversight.

Taken together, these insights suggest a dual mechanism through which regulatory fragmentation may influence tax avoidance. On the one hand, fragmentation can strengthen governance and compliance systems, thereby discouraging tax avoidance; on the other, it may create loopholes and complexity that incentivise opportunistic tax behaviour. Consequently, the central objective of this study is to empirically examine the impact of regulatory fragmentation on corporate tax avoidance.

To achieve this, we employ an extensive unbalanced panel dataset comprising 32,348 firm-year observations of U.S.-listed firms spanning the period 1995 to 2019. The analysis utilises a range of quantitative approaches, including Ordinary Least Squares (OLS) regression, Two-Stage Least Squares (2SLS) with an instrumental variable (IV), and Propensity Score Matching (PSM), to ensure robustness.

Our empirical results reveal a distinct inverse relationship between regulatory fragmentation and tax avoidance, particularly in cases where fewer agencies oversee a given regulatory issue. This finding indicates that firms operating in less fragmented and more coherent regulatory environments are less likely to engage in tax avoidance, owing to clearer compliance requirements and reduced regulatory ambiguity.

Furthermore, we extend the analysis by examining whether the strength of regulatory oversight—termed regulatory intensity—modifies this relationship. Specifically, we hypothesise that higher regulatory intensity reinforces the negative association between regulatory fragmentation and tax avoidance. Consistent with this hypothesis, our results show that firms operating in high-intensity regulatory environments experience a more pronounced reduction in tax avoidance under conditions of fragmented regulation. This suggests that rigorous enforcement and oversight amplify the deterrent effects of regulatory fragmentation, underscoring the importance of enforcement dynamics in moderating the nexus between regulation and tax avoidance.

Our additional analyses reveal that firms characterised by high levels of innovation or superior managerial ability are less likely to engage in tax avoidance when confronted with regulatory fragmentation. This finding suggests that such firms prioritise value creation and long-term strategic growth over short-term tax minimisation. We also observe notable disparities in the extent of tax avoidance according to firms' financial circumstances. Those experiencing greater financial constraint or lower profitability tend to engage in less tax avoidance under conditions of regulatory fragmentation. This behaviour reflects their limited capacity to invest in the complex tax planning structures required to exploit regulatory loopholes effectively.

Furthermore, firms headquartered in regions characterised by a strong local creative culture, or high levels of religious observance also exhibit a lower propensity for tax avoidance. This finding underscores the significance of local cultural context and normativity in shaping corporate tax behaviour. To address potential endogeneity concerns, we employ a 2SLS estimation with instrumental variables and PSM techniques. The results from these robustness tests confirms the validity of our findings, revealing a significant and positive coefficient for the variable regulatory fragmentation, indicating that our model effectively captures the causal impact of regulatory fragmentation on corporate tax avoidance.

This study makes several key contributions to the existing body of literature. First, it reports the first empirical investigation into the relationship between regulatory fragmentation and corporate tax avoidance, thereby addressing a notable gap in prior research. The literature has traditionally examined regulatory compliance and tax avoidance in isolation, often overlooking the interaction between these two critical domains. Our findings identify regulatory fragmentation as a new and significant determinant of corporate tax avoidance behaviour.

Second, we introduce and empirically test a novel hypothesis concerning the moderating effect of regulatory intensity, demonstrating that the deterrent effect of fragmentation on tax avoidance is amplified in high-intensity regulatory environments. This contribution extends the literature by integrating the structural characteristics of regulation with its enforcement dynamics, providing a more holistic understanding of regulatory influence. Third, this research provides new evidence on the indirect role of regulatory fragmentation in shaping corporate tax avoidance through firm-level financial constraints and performance outcomes, contributing to a relatively underexplored area of the literature. Consistent with an agency theory perspective, the findings suggest that fragmented regulatory environments may enhance monitoring through the presence of multiple oversight bodies, thereby strengthening internal controls and reducing

managerial incentives for aggressive tax avoidance. Firms that reduce tax avoidance in response to regulatory fragmentation tend to exhibit higher levels of value creation, thereby revealing a positive link between regulatory compliance and firm performance.

Finally, we offer new evidence on how social, economic, and institutional factors—such as local culture, religion, and political context—moderate the relationship between regulatory intensity and tax avoidance. Collectively, this comprehensive analysis deepens our understanding of the multifaceted interplay among regulation, tax policy, and corporate behaviour, highlighting how the design and intensity of regulatory systems shape firms' strategic financial decisions within diverse institutional contexts.

The rest of the paper is structured as follows: Section 2 reviews the literature. Section 3 presents the methodology, including how we collected data, selected our sample, and the analytical techniques we utilised. Section 4 presents and interprets our empirical findings, shedding light on the observed patterns and relationships. Section 5 tackles potential endogeneity issues, outlining several robustness tests that bolster the reliability of our results and the validity of our conclusions. Section 6 offers additional analyses, providing a more nuanced understanding of the core research questions and examining the influence of specific financial and political contexts on the identified relationships. A final conclusion is offered in Section 7.

3.2 Literature / Hypotheses Development

3.2.1 Corporate Tax Avoidance

Prior literature identifies a diverse range of factors that contribute to corporate tax avoidance, encompassing international, organisational, and managerial dimensions. Key determinants include differences in international tax rates, the strategic use of tax havens, and aggressive tax planning mechanisms. For instance, Desai and Dharmapala (2006) argue that multinational enterprises with complex cross-border operations are particularly prone to tax avoidance due to the opportunities afforded by international tax arbitrage. Likewise, firms with substantial intangible assets, such as many technology-focused corporations, often exploit intellectual property licensing to shift profits towards low-tax jurisdictions (Dischinger & Riedel, 2011).

Corporate governance has also been identified as a critical determinant of tax behaviour. Richardson et al. (2013) find that firms with more independent boards are less likely to engage in aggressive tax planning, highlighting the role of board oversight in constraining excessive

tax avoidance. Similarly, Robinson et al. (2010) demonstrate that firms audited by top-tier accounting firms tend to display lower levels of tax avoidance, suggesting that rigorous external auditing can act as a deterrent against aggressive tax practices.

While much of the extant research has centred on financial and structural characteristics, a growing stream of studies has begun to explore non-financial influences on corporate tax behaviour. Hanlon and Slemrod (2009), for instance, examine the impact of public scrutiny and corporate reputation, finding that firms more sensitive to public perception are less likely to pursue aggressive tax strategies in order to mitigate reputational risk. Similarly, Overesch and Wamser (2010) investigate the role of political connections, revealing that firms with stronger political ties may benefit from favourable tax treatment, therein reducing their need for aggressive tax planning.

A further body of research has explored how managerial incentives shape firms' tax strategies. Executive compensation structures—particularly those with short-term, performance-based incentives—can motivate managers to engage in tax avoidance to enhance reported profitability (Gaertner, 2014). In contrast, Armstrong et al. (2015) suggest that when managerial remuneration is tied to long-term financial health, firms exhibit lower levels of tax avoidance, reflecting a more sustainable approach to financial management.

Extending this discussion, recent scholarship has delved into the complex relationship between corporate governance, executive characteristics, and internal controls in shaping tax avoidance behaviour. Minnick and Noga (2010) demonstrate that firms are more likely to pursue tax avoidance when their internal governance systems implicitly support such strategies, underscoring the importance of internal policy design. The expertise and stability of chief financial officers (CFOs) have also been shown to play a critical role in determining firms' tax positions. Robinson et al. (2010) note that less experienced or frequently changing CFOs are more likely to tolerate or adopt aggressive tax planning techniques, given their limited institutional knowledge or incentives to demonstrate short-term success.

Despite this substantial body of evidence on the determinants of corporate tax avoidance, a notable gap persists in understanding how regulatory fragmentation influences such behaviour. As regulatory environments grow increasingly complex and multi-layered across jurisdictions, the interaction between fragmented regulatory oversight and corporate tax strategies remains underexplored. Addressing this gap is vital for understanding how regulatory design and inter-

agency coordination shape firms' tax planning and compliance decisions in modern financial systems.

3.2.2 Regulatory Fragmentation

Regulatory fragmentation arises when multiple federal agencies exercise overlapping jurisdiction over a specific issue. This phenomenon is particularly prevalent in industries that demand detailed regulatory oversight due to rapid innovation, technological complexity, or extensive international operations—such as financial services, healthcare, and technology (Quirk, 2014). For instance, inconsistencies among environmental regulatory bodies may lead to contradictory pollution control standards, thereby complicating compliance processes for firms and obscuring the assessment of broader environmental outcomes. The implications of regulatory fragmentation are multifaceted, attracting substantial academic attention and debate. While it introduces administrative complexity and raises compliance costs, it can also create opportunities for firms to exploit regulatory disparities for strategic or operational advantage (Kalmenovitz et al., 2022).

From an economic perspective, regulatory fragmentation tends to increase operational and administrative expenses. Firms often experience higher sales, general, and administrative (SG&A) costs from allocating additional resources to manage compliance across multiple and sometimes conflicting regulatory frameworks (Kalmenovitz et al., 2022). Furthermore, discrepancies in regulatory requirements across agencies can lead to reduced total factor productivity (TFP) and lower return on assets (ROA), as firms divert financial and human capital towards meeting disparate compliance obligations (Dawson & Seater, 2013; Trebbi & Zhang, 2022).

Conversely, several studies have highlighted the potential advantages of regulatory fragmentation. Firms may exploit regulatory loopholes or inconsistencies between agencies to pursue innovative solutions or to circumvent stricter rules, to enhance their competitive positioning (Fich et al., 2023). Moreover, the coexistence of multiple regulatory authorities may afford firms greater flexibility to align themselves with the regulator whose frameworks or enforcement philosophies best suit their operational model or existing networks of influence (Quirk, 2014).

Regulatory fragmentation can also serve to strengthen internal control mechanisms within organisations. Xu (2024) contends that firms subject to scrutiny from multiple regulators are likely to exhibit fewer internal control weaknesses, as overlapping oversight compels management to enhance governance structures and compliance standards. Similarly, Kalodimos (2024) finds that regulatory fragmentation increases uncertainty in corporate reporting, reflected through less definitive language and more frequent litigation-related disclosures. In response, companies tend to improve the readability and transparency of financial reports while reducing accounting complexity. This indicates that multi-agency oversight, particularly when carried out by domain-specific experts, can amplify the monitoring benefits of regulation by mitigating informational blind spots and enhancing oversight quality.

Taken together, these findings suggest that regulatory fragmentation presents both challenges and strategic opportunities. While it increases operational burdens and uncertainty, it can simultaneously foster stronger internal governance, transparency, and adaptive corporate behaviour. Thus, the presence of regulatory fragmentation—viewed as both a constraint and a potential competitive advantage—necessitates a balanced and pragmatic approach to both regulatory policy design and corporate strategic decision-making.

3.2.3 Regulatory Fragmentation and Corporate Tax Avoidance

Multiple studies provide compelling evidence that regulatory fragmentation can mitigate corporate tax avoidance by increasing the complexity and costs of compliance. When substantial differences exist across legal and regulatory systems, the burden of compliance rises significantly, reducing the economic feasibility of engaging in aggressive tax planning. For instance, Zhang (2007) demonstrate that the enactment of the Sarbanes-Oxley Act (SOX) substantially increased firms' regulatory compliance costs, posing particular challenges for smaller firms that struggled to meet its extensive requirements. In contexts where multiple regulatory bodies exercise overlapping authority, the probability of enforcement scrutiny also rises, acting as a deterrent to tax avoidance (Huizinga & Laeven, 2008). Dyreng et al. (2010) further observe that regulatory environments directly influence managerial decision-making, implying that heightened legal complexity discourages aggressive tax planning by increasing the perceived risk of detection and sanction.

Borkowski and Gaffney (2021) argue that fragmented regulatory structures elevate compliance costs for multinational corporations, discouraging them from engaging in complex tax planning

schemes. Similarly, Sulaiman et al. (2019) contend that increasing tax law complexity diminishes the incentive for firms to pursue tax avoidance strategies. Law and Mills (2017) also find that managers with limited cognitive capacity to process complex regulations are less likely to engage in sophisticated tax planning, further suggesting that regulatory complexity constrains avoidance behaviour. Collectively, these studies imply that when regulations are fragmented, they impose greater administrative and cognitive burdens on firms, therein curbing their capacity to engage in tax avoidance.

Supporting this line of reasoning, Kalodimos (2024) examines the impact of regulatory fragmentation on financial disclosures, finding that fragmented oversight leads to increased uncertainty, less definitive language, and more frequent references to litigation risk. Firms respond by enhancing the clarity and transparency of their financial reports and simplifying accounting procedures. This suggests that overlapping regulatory regimes who combine the expertise of their multiple authorities may effectively strengthen monitoring and enforcement capacity, reduce blind spots and enhance regulatory oversight. Such increased regulatory scrutiny may further discourage tax avoidance strategies by exposing firms to greater detection risk and more informed enforcement mechanisms.

Conversely, regulatory fragmentation may also facilitate tax avoidance by creating opportunities to exploit regulatory inconsistencies. Firms may engage in regulatory arbitrage, exploiting jurisdictional differences and loopholes to shift profits to regions offering favourable tax treatment, to reduce their overall tax liability. Desai and Dharmapala (2006) highlight how multinational corporations strategically leverage fragmented systems to reduce their effective tax burdens. Picciotto (2018) further observes that transnational corporations actively exploit variations in international tax regulations to gain competitive advantage through cross-border profit shifting. Similarly, Lehmann (2017) discusses how duplicative and overlapping global financial regulations generate regulatory uncertainty, which corporations can manipulate to obtain advantageous tax positions. Cauble (2017) also illustrates how tax experts exploit such discrepancies by designing hybrid financial instruments treated differently across jurisdictions, enabling firms to secure preferential tax outcomes. Collectively, these findings underscore how uncoordinated regulatory systems can inadvertently encourage tax avoidance by expanding opportunities for jurisdictional arbitrage.

The relationship between regulatory fragmentation and corporate tax avoidance is therefore complex and multidimensional, warranting analysis through several theoretical lenses.

According to Transaction Cost Economics (Williamson, 1981), firms strive to minimise the costs associated with regulatory compliance. When confronted with a fragmented regulatory landscape, they may engage in tax avoidance to offset the additional transaction and compliance costs. Supporting this, Kalmenovitz et al. (2022) find that firms operating under highly fragmented regulatory regimes report significantly higher compliance costs, which may, in turn, stimulate more aggressive tax planning behaviour.

Nonetheless, regulatory fragmentation may enhance corporate governance and internal control mechanisms. From an agency theory perspective, increased regulatory oversight—particularly in the presence of multiple regulatory agencies—can be viewed as an external monitoring mechanism that strengthens oversight and aligns managerial actions with legal and ethical standards. Jensen and Meckling (1976) argue that effective monitoring reduces agency conflicts and curtails managerial opportunism, thereby promoting transparency and compliance. In this context, fragmented oversight increases the likelihood of detection and reinforces internal control systems, which in turn diminishes managerial incentives for aggressive tax avoidance (Herrera-Cano & González-Pérez, 2019; Hoseini et al., 2019). Empirical evidence from Xu (2024) supports this argument, showing that firms subject to fragmented oversight exhibit fewer internal control weaknesses, suggesting that multiple regulators reinforce monitoring effectiveness.

Taken together, these contrasting perspectives suggest that regulatory fragmentation can both discourage and enable tax avoidance. On the one hand, it may reduce tax avoidance by raising compliance costs, strengthening oversight, and enhancing governance. On the other, it may encourage tax avoidance by introducing loopholes and enabling regulatory arbitrage. This duality highlights the need for empirical investigation into how the degree of regulatory fragmentation affects firms' tax planning behaviour. Accordingly, we formulate our primary hypothesis as follows:

H1: There is a significantly negative relationship between regulatory fragmentation and corporate tax avoidance.

3.2.4 Regulatory Intensity and Regulatory Fragmentation

As explained, regulatory fragmentation arises when multiple agencies exercise overlapping authority over similar areas of corporate activity, resulting in complex and multilayered

compliance environments. Prior research has highlighted the associated costs of such fragmentation, including operational inefficiencies, conflicting regulatory requirements, and diminished firm productivity (Kalmenovitz et al., 2022). However, emerging evidence suggests that fragmentation may also produce compliance-enhancing effects, particularly in domains such as corporate tax behaviour. For instance, Xu (2025) provides empirical evidence that regulatory fragmentation is negatively associated with tax avoidance, indicating that fragmented oversight can heighten firms' perceived enforcement risks and regulatory uncertainty, prompting them to adopt more conservative tax strategies.

However, this effect is unlikely to be uniform across all institutional contexts. A critical factor conditioning the impact of fragmentation is regulatory intensity—defined by Kalmenovitz, (2023) as the frequency, scope, and stringency of rule-making, monitoring, and enforcement by government agencies. Kalmenovitz (2023) finds that firms simultaneously exposed to high fragmentation and high regulatory intensity—such as from multiple enforcement-oriented agencies, as the SEC and DOJ are—tend to disclose greater uncertainty and litigation-related risks in their financial reports. This pattern suggests that high regulatory intensity amplifies the disciplining effect of fragmentation, as firms appreciate the gravity of greater sanctions and reputational consequences for non-compliance.

Further empirical evidence reinforces this interpretation. Kalmenovitz et al. (2022) demonstrate that while fragmentation generally imposes cost by reducing profitability and productivity, these effects are more pronounced when regulatory agencies operate independently rather than collaboratively. This finding implies that uncoordinated but highly active regulators impose stronger compliance burdens. Similarly, Bi et al. (2025) show that firms with robust internal governance mechanisms exhibit lower levels of earnings management under fragmented regulatory regimes. This aligns with the principles of Agency Theory (Jensen & Meckling, 1976), which posits that both internal and external monitoring can constrain managerial discretion and limit opportunistic behaviour.

Building on this theoretical foundation, regulatory intensity can be seen as a complementary governance mechanism that reinforces the compliance-enhancing effects of regulatory fragmentation. Heightened regulatory intensity strengthens external monitoring, closes enforcement gaps, and raises the expected costs of non-compliance. In this sense, regulatory intensity functions as an external control system that magnifies the deterrent power of fragmented oversight, compelling firms to adopt more transparent and risk-averse tax strategies.

Integrating these theoretical and empirical insights, we argue that when regulatory intensity is high, the capacity of fragmented oversight to curb tax avoidance becomes more pronounced. Under such conditions, firms face compounded oversight pressures, which make aggressive tax planning less feasible and less attractive. Conversely, when regulatory intensity is low, fragmented oversight may fail to deter avoidance, as monitoring remains inconsistent and enforcement risk declines.

Drawing on the above discussion, we therefore propose the following hypothesis:

H2: Regulatory intensity moderates the association between regulatory fragmentation and tax avoidance.

3.3 Research Methodology

3.3.1 Sample

Our study examines research hypotheses involving firms in the United States from 1995 to 2019. We utilise data from two primary sources in our analysis. First, financial data and measures of tax avoidance—our dependent variable—are sourced from the Compustat database. This provides an inclusive, comprehensive, and reliable set of financial information for the firms included in our study. The primary focus of this research is regulatory fragmentation, assessed using the unique machine learning-based measurement developed by Kalmenovitz et al. (2022). The regulatory fragmentation data, obtained from Kalmenovitz et al. (2022), indicate the number of agencies overseeing a single topic[8]. Their study provides annual data covering the years 1995 to 2019 so our analysis focuses on the same period.

Additionally, consistent with previous research, we exclude firms operating within regulated utilities (SIC codes 4900–4999) and the financial sector (SIC codes 6000–6999). We also omit any firm-year observations lacking regulatory fragmentation (Reg_Frag) data, resulting in a total of 32,348 firm-year observations used for the analyses of regulatory fragmentation, tax avoidance, and firm-level control variables (see **Table 3-1**).

Table 3-1: Sample Selection

Data	Firm-Year Observations
Reg_Frag data available	60,534

[8] https://sites.google.com/view/jkalmenovitz

(+) COMPUSTAT data and (-) (SIC 4900–4999), (SIC 6000–6999)	48,736
(-) Missing CETR data	33,762
(-) Missing value for dependent and control variable (final sample)	32,348

3.3.2 Dependent Variable: Tax Avoidance

To assess corporate tax avoidance, we utilise the cash effective tax rate (CETR). This metric is calculated by dividing cash taxes paid by pre-tax book income after deducting special items[9]. CETR is widely recognised in the academic literature (Armstrong et al., 2012; Hasan et al., 2014; Kubick et al., 2015) for accurately representing the actual taxes paid by firms, thus providing insight into effective tax avoidance practices. Dyreng et al. (2008) identify CETR as a reliable measure because it accounts for tax benefits arising from employee stock options and remains unaffected by changes in accounting estimates. Following Hasan et al. (2014), we adjust CETR to fall within the range [0, 1] to ensure meaningful economic interpretation. Higher CETR values correspond to lower levels of tax avoidance while lower CETR values indicate higher levels of tax avoidance.

Additionally, we compute this measure using the long-run (five-year) CETR to mitigate substantial year-to-year fluctuations in single-year tax avoidance measures (Dyreng et al., 2008; Chen et al., 2010; Hope et al., 2013; Lennox et al., 2013; Lisowsky et al., 2013)[10]. The CETR measure calculates a firm's cash effective tax rate by dividing the total cash taxes paid over the previous five years by the total pre-tax income, net of special items over the same period. This approach captures both permanent and temporary book-tax differences. Consistent with prior research (e.g., Dyreng et al., 2008; Hope et al., 2013), we truncate our measures to the [0, 1] range and exclude observations with negative total pre-tax income, net of total special items, over the preceding five years.

3.3.3 Independent Variable: Regulatory Fragmentation

The primary metric in this study is regulatory fragmentation (Reg_Frag), as defined by Kalmenovitz et al. (2022). Their research introduces a firm-level measure of regulatory

[9] CETR = TXPD5 / PI5 – SPI5 and the PI5 measure as pre-tax book income (#170) over the most recent five years, and the SPI5 measure as special items (#17) over the most recent five years.

[10] Although no single measure of tax avoidance is flawless, the long-term perspective offers a significant advantage by allowing sufficient time for the IRS to audit and challenge uncertain tax positions.

fragmentation, noting that multiple regulatory bodies frequently issue regulations on specific topics and that firms experience varying degrees of exposure to these topics. This measurement employs a three-step methodology: first, conducting a textual analysis of the Federal Register to identify regulatory topics; second, determining the relevant regulatory agencies mentioned in the Federal Register documents; and third, comparing the relevance of each regulatory topic to each firm-year based on the firms' 10-K reports. This approach uniquely captures the dynamic nature of regulatory activities by encompassing not only existing rules but also the initiation and implementation of new regulations, thereby providing an inclusive perspective on regulatory flows (Kalmenovitz et al., 2022, p. 5). See Appendix for more details.

3.3.4 Main Model

To test the first hypothesis (**H1**), we examine the relationship between regulatory fragmentation and tax avoidance, represented by the variable Reg_Frag and CETR. The regression model is specified as follows:

$$\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ Reg\_Frag_{i,t+t} + \beta 2\ Topic\_Dis_{i,t+t} + \beta 3\ Reg\_Quantity_{i,t} + \beta 4\ MTB_{i,t} + \beta 5\ LEV_{i,t} + \beta 6\ FI_{i,t} + \beta 7\ PPE_{i,t} + \beta 8\ INTAN_{i,t} + \beta 9\ EQUITY_{i,t} + \beta 10\ RD_{i,t} + \beta 11\ ROA_{i,t} + + \beta 12\ CNOL_{i,t} + \beta 13\ NOL_{i,t} + \beta 14\ ACCRUALS_{i,t} + \beta 15\ MASCORE_{i,t} + \beta 16\ PT_{i,t} + \beta 17\ SIZE_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$$

In order to examine our second hypothesis (**H2**), we conduct empirical research to quantify the impact of regulatory intensity on the correlation between regulatory fragmentation and tax avoidance. The model is structured in the following manner:

$$\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ Reg\_Frag_{i,t} + RegIn_{i,t} + RegIn_{i,t} * Reg\_Frag_{i,t} + Control\ variables_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$$

where the dependent variable, tax avoidance, is measured by CETR for firm i over the long run, five years. Our primary variable of interest is regulatory fragmentation (Reg_Frag), as defined by Kalmenovitz et al. (2022), whose approach we follow, and control for the dispersion of topics (Topic_Dis), indicating the spread of topics within firms, and regulation quantity (Reg_Quantity), representing the volume of regulations applicable to a firm's operations. We incorporate various firm-specific characteristics to account for potential factors influencing tax-avoidance activities. Previous studies (e.g., Stickney & McGee, 1982; Zimmerman, 1983; Mills et al., 1998; Rego, 2003; Chen et al., 2010; Cheng et al., 2012) indicate that business complexity

and economies of scale may be linked to tax avoidance. Larger companies and those with more complex operations often have more resources to engage in tax avoidance strategies. Therefore, we include several variables—market-to-book ratio (MTB), leverage ratio (LEV), income from foreign operations (FI), total plant, property, and equipment (PPE), intangible assets (INTANG), income related to the equity method (EQUITY), and research and development activity (RD)—to control for business complexity and economies of scale. These variables are expected to be positively associated with tax avoidance.

We also include return on assets (ROA), net operating loss carryforwards (NOL), and changes in net operating loss (CNOL) as indicators of a company's motivation to avoid income taxes (Rego, 2003; Chen et al., 2010). Additionally, we control for total accruals (ACCRUALS), given the positive relationship between earnings management activities and tax avoidance reported by Frank, Lynch and Rego (2009). We incorporate the managerial ability score (MA_SCORE) developed by Demerjian et al. (2013) to account for management abilities, as Koester et al. (2017) find that more capable managers are more likely to engage in strategic tax planning. All models include year (t) and industry (i) fixed effects to control for unobserved time-invariant and industry-specific characteristics. We determine regulatory intensity (RegIn) by following the methodology of Kalodimos (2025), which calculates the number of final rules issued by the regulatory agencies overseeing each firm's industry in a given year, scaled by the total number of such rules across all industries. This measure captures the relative level of regulatory activity faced by each firm, reflecting both the frequency and scope of agency actions. The Appendix provides definitions for all variables used in the model.

3.4 Analysis Results and Discussion

3.4.1 Summary Statistics and Correlations

Table 3-2 presents the summary statistics of the variables used in our analysis. Our dependent variable, the cash effective tax rate (CETR), indicates an average tax avoidance measure of 0.210, with a standard deviation of 0.207, suggesting moderate variability across firms. On the other hand, regulatory fragmentation (Reg_Frag), our main variable of interest, shows an average of 0.796 with a slightly wider standard deviation of 0.030, indicating that while there is some variability in the degree of regulatory fragmentation experienced by firms, it is relatively stable. The dispersion of topics (Topic_Dis) and regulation quantity (Reg_Quantity)

reflect the breadth and volume of regulations, with averages of 0.937 and 11.98, respectively, and both demonstrate low variability.

Table 3-2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
CETR	32348	0.210	0.207	0.000	1.000
Reg_Frag	32348	0.796	0.030	0.716	0.857
RegIn	32348	104.4	8.955	82.53	126.2
Topic_Dis	32348	0.937	0.010	0.910	0.959
Reg_Quantity	32348	11.98	0.382	11.57	13.19
MTB	32348	2.889	5.260	-16.44	33.78
LEV	32348	0.280	0.320	0.000	1.947
FI	32348	0.012	0.035	-0.093	0.165
PPE	32348	0.264	0.247	0.004	1.102
INTAN	32348	0.204	0.241	0.000	1.178
EQUITY	32348	0.001	0.004	-0.012	0.026
RD	32348	0.041	0.080	0.000	0.456
ROA	32348	0.074	0.211	-1.208	0.419
CNOL	32348	0.050	0.274	-0.832	1.781
NOL	32348	0.740	2.447	00.000	18.66
ACCRUALS	32348	-0.078	0.143	-0.880	0.277
MA_SCORE	32348	-0.008	0.117	-0.219	0.486
SIZE	32348	6.054	2.155	-4.711	13.46

Notes: This panel presents summary statistics for all the variables used in our analyses. All variables are defined in the Appendix.

The firm-specific characteristics incorporated to control for factors that may affect tax avoidance exhibit a range of means and variability. The market-to-book ratio (MTB) averages 2.88, indicating that the average firm in our sample has a market value approximately three times its book value. The leverage ratio (LEV) averages 0.280, suggesting varied levels of debt financing among firms. Foreign income (FI) and property, plant, and equipment (PPE) show relatively low averages of 0.012 and 0.264, respectively, yet exhibit substantial dispersion, as reflected in their standard deviations. Intangible assets (INTAN) display an average close to zero, implying that not all firms report significant intangible assets. Income related to the equity method (EQUITY) and research and development activity (RD) also have low averages, suggesting that these are not predominant activities for most firms in the sample. However, the higher maximum values indicate that for some firms, these factors are indeed substantial.

Regarding the proxies for firms' incentives to engage in tax avoidance, the average return on assets (ROA) is 0.074, with a negative minimum, indicating that some firms experience losses. Net operating loss carryforwards (NOL) and the change in net operating loss (CNOL) have averages of 0.050 and 0.740, respectively, with wide ranges, highlighting the variability in firms' tax positions. Total accruals (ACCRUALS) have a slightly negative average, hinting at

a conservative approach to earnings management across the sample. The managerial ability score (MA_SCORE), which is expected to correlate positively with strategic tax-planning activities, is minimal on average, suggesting the need for further analysis into how managerial ability interacts with tax avoidance behaviour. Finally, the average firm size (SIZE) is 6.054, with a standard deviation of 1.98, indicating substantial cross-sectional variation in firm size within the sample, ranging from small entities to large multinational firms.

The correlation matrix in **Table 3-3** provides a nuanced overview of the relationships between tax expenditure—our chosen proxy for tax avoidance—and various explanatory factors. The dependent variable, CETR, when interpreted as tax expenditure, implies that a positive correlation denotes a counterintuitive relationship: a decrease in tax avoidance as the corresponding variable increases. This relationship is particularly notable for regulatory fragmentation (Reg_Frag), where a correlation coefficient of 0.155 suggests that as regulatory fragmentation rises, tax expenditure does also, although the effect remains moderate. Variables being negatively correlated with CETR, such as the market-to-book ratio (MTB) and leverage (LEV), indicates that as these financial indicators increase, tax expenditure tends to decrease. This suggests that firms with higher market valuations relative to their book value, or those employing greater leverage, engage in more tax avoidance, potentially leveraging their financial structures to minimise tax liability. It is also noteworthy that the managerial ability score (MA_SCORE) is negatively correlated with CETR, indicating that higher managerial ability may be associated with increased tax avoidance, as theoretically expected. Conversely, firm size (SIZE) is positively correlated with CETR, which may reflect the propensity of larger firms to incur higher tax expenditure due to their complex operational structures and the accompanying regulatory scrutiny.

Table 3-3: Matrix of Correlations

Variables	1	2	3	4	5	6	7	8	9
(1) CETR	1.000								
(2) Reg_Frag	0.155***	1.000							
(3) RegIn	-0.102***	-0.290***	1.000						
(4) Topic_Dis	-0.061***	0.000	-0.036***	1.000					
(5) Reg_Quantity	-0.115***	-0.427***	0.466***	0.017***	1.000				
(6) MTB	-0.028***	-0.045***	0.042***	0.049***	0.074***	1.000			
(7) LEV	-0.127***	-0.190***	0.023***	-0.090***	0.119***	-0.058***	1.000		
(8) FI	0.061***	0.053***	0.048***	-0.067***	0.015***	0.080***	-0.042***	1.000	
(9) PPE	-0.045***	-0.064***	-0.107***	-0.044***	-0.011*	-0.041***	0.246***	-0.048***	1.000
(10) INTAN	-0.001	-0.109***	0.186***	-0.097***	0.107***	0.042***	0.252***	0.067***	-0.258***
(11) EQUITY	0.032***	-0.025***	-0.016**	-0.064***	-0.007	0.009*	0.032***	0.060***	0.069***
(12) RD	-0.208***	0.012**	0.044***	0.206***	0.005	0.081***	-0.091***	-0.028***	-0.281***
(13) ROA	0.250***	0.150***	-0.051***	-0.119***	-0.074***	0.068***	-0.152***	0.217***	0.176***
(14) CNOL	-0.143***	-0.069***	0.014**	0.083***	0.019***	0.017***	0.155***	-0.082***	-0.048***
(15) NOL	-0.250***	-0.122***	0.091***	0.116***	0.048***	-0.019***	0.272***	-0.088***	-0.095***
(16) ACCRUALS	0.170***	0.074***	-0.048***	-0.046***	-0.018***	0.009*	-0.200***	0.144***	-0.064***
(17) MA_SCORE	-0.011**	0.043***	-0.030***	0.043***	-0.050***	0.072***	-0.032***	0.108***	-0.019***
(18) SIZE	0.110***	-0.054***	0.127***	-0.237***	0.171***	0.100***	0.082***	0.243***	0.191***
Variables	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
(10) INTAN	1.000								
(11) EQUITY	-0.005	1.000							
(12) RD	-0.076***	-0.078***	1.000						
(13) ROA	0.080***	0.059***	-0.418***	1.000					
(14) CNOL	0.008	-0.035***	0.243***	-0.487***	1.000				
(15) NOL	-0.049***	-0.040***	0.365***	-0.619***	0.449***	1.000			
(16) ACCRUALS	-0.003	0.071***	-0.190***	0.476***	-0.349***	-0.387***	1.000		
(17) MA_SCORE	-0.138***	-0.003	0.129***	0.107***	-0.018***	0.058***	0.031***	1.000	
(18) SIZE	0.250***	0.122***	-0.268***	0.430***	-0.220***	-0.441***	0.230***	0.016***	1.000

Notes: This table reports Pearson correlations among the main variables used in our analyses. All variables are defined in the Appendix. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

The correlations outlined here—both expected and unexpected—serve as preliminary indicators of the multifaceted determinants influencing firms' tax-related decisions. These relationships will be examined further in the regression analyses, where the intricate interactions among firm characteristics, regulatory factors, and tax expenditure will be explored to elucidate their collective impact on firms' tax avoidance strategies.

3.4.2 Regression Results and Discussion

The linear regression results presented in **Table 3-4** provide a comprehensive examination of the determinants of tax avoidance behaviour, as measured by CETR. The positive and highly significant coefficients for regulatory fragmentation (Reg_Frag) in both Models (1) and (2) indicate that an increase in regulatory fragmentation corresponds with a reduction in tax avoidance. Specifically, a one-unit increase in Reg_Frag is associated with a 0.695 increase in CETR in Model (1) and a 0.181 increase in CETR in Model (2). This finding challenges the conventional assumption that a more fragmented regulatory environment promotes tax avoidance by providing firms with greater opportunities to exploit loopholes. Instead, it suggests that greater regulatory complexity may discourage firms from engaging in aggressive tax avoidance practices, likely through enhanced monitoring, increased detection risk, and higher compliance costs. From an agency theory perspective, fragmented regulatory environments can be interpreted as strengthening external monitoring mechanisms, thereby limiting managerial discretion and reducing incentives for opportunistic tax behaviour (Jensen and Meckling, 1976; Desai and Dharmapala, 2006).

Topic dispersion (Topic_Dis) demonstrates a strong and negative association with CETR in both models, with coefficients of -1.535 in Model (1) and -0.600 in Model (2), implying that greater dispersion of regulatory topics is linked with lower CETR (higher tax avoidance). The consistency of this result across both models suggests that when regulatory attention is dispersed across numerous topics, monitoring effectiveness may weaken, reducing detection probability and allowing greater managerial discretion in tax planning. This interpretation is consistent with prior research suggesting that diffuse oversight structures may create gaps in enforcement and reduce regulatory effectiveness.

Regulation quantity exhibits a small yet negative effect in Model (2) (-0.064), significant at the 1% level, indicating that a larger volume of regulations may marginally reduce CETR. This may reflect a compliance burden effect, whereby an increase in the number of regulations does

not necessarily improve monitoring quality but instead creates complexity that firms can navigate strategically, consistent with prior evidence that regulatory overload may reduce enforcement efficiency.

Several control variables also yield noteworthy results. The market-to-book ratio (MTB), leverage ratio (LEV), property, plant, and equipment (PPE), intangibles (INTAN), and research and development expenditure (RD) all show negative and statistically significant relationships with CETR, aligning with prior literature linking these firm characteristics to greater tax avoidance. In contrast, foreign income (FI) and return on assets (ROA) exhibit positive associations with CETR, suggesting that more profitable firms and those with higher levels of foreign income tend to engage in less aggressive tax avoidance, potentially due to increased scrutiny and reputational concerns. Other variables, including the change in net operating loss (CNOL), net operating loss carryforwards (NOL), accruals (ACCRUALS), managerial ability score (MA_SCORE), and firm size (SIZE) also display significant effects, underscoring the multifaceted nature of corporate tax behaviour.

In addition to statistical significance, the economic magnitude of the estimated coefficients further reinforces the importance of the results. The coefficient on regulatory fragmentation (Reg_Frag) suggests that a one-unit increase is associated with an increase in CETR of 0.695 in Model (1) and 0.181 in Model (2). However, a one-unit change represents a relatively large shift in regulatory fragmentation. To provide a more economically meaningful interpretation, we consider a one standard deviation increase in regulatory fragmentation. Based on the sample distribution, such a change corresponds to an increase in CETR of approximately 2.12% in Model (1) and 0.55% in Model (2). Given that CETR typically ranges between zero and one, these effects are economically meaningful. In particular, even moderate increases in regulatory fragmentation lead to economically meaningful changes in firms' effective tax rates, implying a reduction in tax avoidance behaviour. This indicates that regulatory fragmentation is not only statistically significant but also economically impactful in shaping corporate tax outcomes.

Table 3-4: Linear Regression

	(1) **Dependent variable = CETR**	**(2)** **Dependent variable = CETR**
Reg_Frag	0.695***	0.181***
	(10.27)	(2.67)
Topic_Dis	-1.535***	-0.600***
	(-11.39)	(-4.48)
Reg_Quantity	-0.032	-0.064***

	(-1.43)	(-2.88)
MTB	-	-0.001***
		(-5.07)
LEV	-	-0.033***
		(-8.80)
FI	-	0.128***
		(3.81)
PPE	-	-0.087***
		(-13.92)
INTAN	-	-0.015***
		(-2.81)
EQUITY	-	0.826***
		(2.91)
RD	-	-0.302***
		(-18.96)
ROA	-	0.100***
		(14.72)
CNOL	-	0.007*
		(1.68)
NOL	-	-0.007***
		(-14.36)
ACCRUALS	-	0.020**
		(2.22)
MA_SCORE	-	-0.034***
		(-3.96)
SIZE	-	0.004***
		(5.42)
CONSTANT	1.483***	1.417***
	(3.97)	(3.89)
N	32348	32348
R^2	0.083	0.151
Clustering	By firm and year	By firm and year
adj. R^2	0.081	0.148

Notes: This table presents regression results examining the effect of regulatory fragmentation on tax avoidance (Hypothesis 1) in Columns (1) and (2). All variables are defined in the Appendix. Standard errors are reported in parentheses with standard errors clustered by firm and year. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Having established a significant and robust inverse relationship between regulatory fragmentation and tax avoidance, it is crucial to explore the contextual factors that may influence the strength of this relationship. Prior research demonstrates that the effectiveness of regulation often depends on the quality and enforcement of institutional mechanisms. For example, Djankov et al. (2003) show that variations in contractual enforcement procedures across countries significantly affect firms' behaviour and compliance levels. In the context of taxation, Desai and Dharmapala (2006) find that stronger governance and monitoring mechanisms reduce tax sheltering behaviour, highlighting the importance of oversight in constraining managerial discretion.

Building on this reasoning, regulatory intensity, defined as the vigour, frequency, and enforcement orientation of regulatory oversight, emerges as a plausible moderating factor.

From a monitoring perspective, higher regulatory intensity is expected to increase the probability of detection and strengthen enforcement credibility, thereby amplifying the disciplining effect of regulatory fragmentation. In other words, fragmented oversight is likely to deter tax avoidance more effectively when regulatory bodies are active and enforcement-oriented, as firms face both overlapping scrutiny and credible enforcement threats.

The results presented in **Table 3-5** provide empirical evidence of the moderating role of regulatory intensity in the relationship between regulatory fragmentation and tax avoidance. Across both model specifications, the coefficient for regulatory fragmentation (Reg_Frag) remains positive and statistically significant (0.379, t = 4.78 in Model (1); 0.130, t = 1.66 in Model (2)), consistent with the baseline results in **Table 3-4**, where greater fragmentation is associated with a higher CETR, indicating lower tax avoidance. The coefficient for regulatory intensity (RegIn) is also positive and significant in both models (0.001, t = 2.73 in Model (1); 0.001, t = 2.71 in Model (2)), implying that higher levels of regulatory activity and enforcement are directly linked to higher CETR values. Most importantly, the interaction term (Reg_Frag × RegIn) is positive and significant in both models (0.026, t = 4.67 in Model (1); 0.014, t = 2.63 in Model (2)), providing strong support for H2. This finding suggests that the inverse relationship between regulatory fragmentation and tax avoidance becomes stronger in environments characterised by higher regulatory intensity. This result is consistent with the theoretical expectation that the joint presence of fragmented oversight and strong enforcement enhances monitoring effectiveness, increases detection risk, and reduces managerial discretion in tax planning, thereby reinforcing compliance-oriented behaviour.

Table 3-5: The Moderating Effect of Intensity

	(1) **Dependent variable = CETR**	**(2)** **Dependent variable = CETR**
Reg_Frag	0.379***	0.130*
	(4.78)	(1.66)
RegIn	0.001***	0.001***
	(2.73)	(2.71)
Reg_Frag * RegIn	0.026***	0.014***
	(4.67)	(2.63)
Topic_Dis	-1.162***	-0.332**
	(-7.17)	(-2.07)
Reg_Quantity	-0.035	-0.039
	(-1.29)	(-1.49)
ROA	-	0.113***
		(11.86)
MTB	-	-0.001***
		(-3.75)

LEV	-	-0.040***
		(-7.72)
FI	-	0.029
		(0.75)
PPE	-	-0.083***
		(-10.79)
INTAN	-	-0.009
		(-1.48)
EQUITY	-	0.435
		(1.32)
RD	-	-0.311***
		(-14.80)
CNOL	-	0.009
		(1.53)
NOL	-	-0.010***
		(-13.42)
ACCRUALS	-	0.041***
		(3.33)
MA_SCORE	-	-0.034***
		(-3.34)
SIZE	-	0.004***
		(4.52)
CONSTANT	0.215***	0.239***
	(60.07)	(35.59)
Industry fixed effect	Included	Included
Year fixed effect	Included	Included
N	24930	24930
R^2	0.079	0.145
Clustering	By firm and year	By firm and year
adj. R^2	0.075	0.141

Notes: This table presents regression results examining the moderating effect of regulatory intensity on the relation between regulatory fragmentation and tax avoidance (CETR) (Hypothesis 2) in Columns (1) and (2). All variables are defined in the Appendix. Standard errors are reported in parentheses with standard errors clustered by firm and year. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

In practical terms, when regulatory oversight is both fragmented and accompanied by active enforcement, firms appear less inclined to exploit potential loopholes, likely due to heightened perceived detection risk and increased compliance costs.

The control variables behave largely as expected. Topic dispersion remains negative and statistically significant, suggesting that broader dispersion of regulatory topics is associated with lower CETR (greater tax avoidance). Several firm-level controls—namely return on assets (ROA), leverage (LEV), property, plant, and equipment (PPE), net operating losses (NOL), accruals (ACCRUALS), managerial ability score (MA_SCORE), and firm size (SIZE)—exhibit significant relationships with CETR, reaffirming the importance of accounting for heterogeneity in firm characteristics. Overall, these findings not only confirm the baseline relationship but also demonstrate that regulatory intensity constitutes a key institutional factor that amplifies the deterrent effect of fragmentation on tax avoidance. This conclusion aligns

with prior evidence indicating that enforcement-oriented environments strengthen the compliance effects of regulatory structures (Djankov et al., 2003; Desai & Dharmapala, 2006).

3.5 Endogeneity Tests

In this section, we examine endogeneity through various tests. One common concern is the potential bias caused by omitting relevant variables, which can be mitigated by including as many explanatory variables as possible. However, this approach is not always feasible due to limited data availability and the use of proxies that may introduce measurement errors. To strengthen our findings on the negative relationship between regulatory fragmentation and tax avoidance, we control for several factors that influence tax avoidance. Despite these efforts, we acknowledge the possibility of omitting variable bias mentioned earlier. Nevertheless, we conduct the second stage of the Two-Stage Least Squares (2SLS) with an instrumental variable (IV) and the Propensity Score Matching (PSM) Test, where we find a significant and positive coefficient for the variable Reg_Frag.

3.5.1 Two-Stage Least Squares

Reg_Frag and Av_Reg

To re-evaluate the impact of regulatory fragmentation on corporate tax avoidance, we employ a Two-Stage Least Squares (2SLS) regression model with an instrumental variable (IV) approach. This methodology helps address potential endogeneity concerns and allows us to assess the robustness of our baseline findings using IV specifications. In line with Xu (2024), we construct an instrument based on the average regulatory fragmentation of peer firms within the same industry as firm i in year t−1 (Av_Reg), excluding the firm's own regulatory fragmentation (Reg_Frag). This IV approach addresses endogeneity concerns by utilising a variable that is likely correlated with the focal firm's regulatory fragmentation but is unlikely to directly affect its tax avoidance behaviour.

Reg_Frag is defined as the number of regulatory agencies overseeing a given regulatory topic for firm i in year t, capturing the extent of regulatory fragmentation faced by the firm. Av_Reg is constructed as the industry-year average of regulatory fragmentation across peer firms, excluding the focal firm.

In the first stage, we estimate the impact of the instrument (Av_Reg) on regulatory fragmentation (Reg_Frag), controlling for the same set of variables as reported in **Table 3-4**. In the second stage, we regress tax avoidance on the predicted value of Reg_Frag obtained from the first stage, along with the same control variables used in the baseline model. The IV estimation results reported in Table 3-6 provide robust evidence that the relationship between regulatory fragmentation and corporate tax avoidance is not driven by endogeneity concerns.

Table 3-6 reports the results of the 2SLS estimation, where Av_Reg serves as the instrument for Reg_Frag. The results show that regulatory fragmentation exerts a negative and statistically significant impact on CETR. The IV approach therefore provides further evidence that regulatory fragmentation continues to influence corporate tax avoidance after addressing potential endogeneity concerns. Taken together, these findings suggest that regulatory fragmentation exerts a significant and persistent influence on corporate tax avoidance.

To further assess the validity of the instrumental variable approach, we report a series of standard diagnostic tests for instrument relevance and strength. First, the Kleibergen–Paap rk LM statistic is highly significant (Chi-sq = 1081.66, $p < 0.001$), rejecting the null hypothesis of weak identification and confirming that the instrument is sufficiently correlated with the endogenous variable. Second, the strength of the instrument is evaluated using the Kleibergen–Paap rk Wald F statistic, which is 1238.04 and substantially exceeds the Stock–Yogo critical values (e.g., 16.38 at the 10% maximal IV size), indicating that the instrument is not weak. Finally, the Hansen J statistic is equal to zero, reflecting that the model is exactly identified, and therefore the overidentification test is not applicable in this setting. Overall, these diagnostic results provide strong and consistent support for the validity and strength of the instrument, reinforcing the credibility of the causal interpretation of the 2SLS estimates.

In the regression models reported in **Table 3-6**, tax avoidance—proxied by CETR—is the dependent variable. Reg_Frag measures the number of agencies overseeing a single regulatory topic, while Av_Reg represents the average regulatory fragmentation of peer firms within the same industry.

Table 3-6: Two-Stage Least Squares (2SLS)

	Two-Stage Least Squares (2SLS) regression	
	(1)	**(2)**
	Dependent variable Regulatory fragmentation	**Dependent variable CETR**
Av_Reg	0.396***	-
	(40.81)	

Reg_Frag	-	0.783***
		(3.08)
Topic_Dis	-0.043***	-0.658***
	(-3.10)	(-4.25)
Reg_Quantity	-0.075***	-0.032
	(-32.09)	(-0.94)
MTB	-0.000*	-0.001***
	(-1.96)	(-4.95)
LEV	-0.002***	-0.031***
	(-6.58)	(-7.52)
FI	0.017***	0.076**
	(6.59)	(2.11)
PPE	-0.006***	-0.068***
	(-10.67)	(-9.26)
INTAN	-0.002***	-0.018***
	(-3.49)	(-3.05)
EQUITY	-0.071***	1.151***
	(-2.74)	(3.48)
RD	0.016***	-0.316***
	(11.29)	(-18.35)
ROA	0.007***	0.087***
	(10.40)	(11.58)
CNOL	-0.000	0.004
	(-1.16)	(1.05)
NOL	-0.000	-0.007***
	(-0.18)	(-13.34)
ACCRUALS	-0.002**	0.018*
	(-2.01)	(1.82)
MA SCORE	-0.003***	-0.028***
	(-4.17)	(-3.04)
SIZE	0.002***	0.003***
	(26.61)	(3.32)
CONSTANT	1.399***	0.697
	(36.90)	(1.11)
N	25783	25783
R^2	0.770	0.150
adj. R^2	0.769	0.147

Notes: This table presents the regression results obtained by employing the two-stage instrumental variable approach. All variables are defined in the Appendix. Standard errors are reported in parentheses with standard errors clustered by firm and year. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

3.5.2 Propensity Score Matching Test

In this section, we employ the Propensity Score Matching (PSM) methodology to address potential differences between firms with varying levels of regulatory fragmentation. Following prior literature (e.g., Shipman et al., 2017), this approach allows us to control for observable characteristics that may not be fully captured by conventional linear models. Firms are classified into treatment and control groups based on a median split of regulatory fragmentation (Reg_Frag). Firms with above-median Reg_Frag are assigned to the treatment group (high fragmentation), while those below the median are assigned to the control group (low fragmentation).

The propensity scores are estimated using a probit model, where the dependent variable is an indicator for high regulatory fragmentation. The model includes firm-level control variables consistent with the baseline specification, including MTB, LEV, FI, PPE, INTAN, EQUITY, RD, ROA, CNOL, NOL, ACCRUALS, MA_SCORE, and SIZE, in addition to year and industry fixed effects. Topic_Dis and Reg_Quantity are excluded from the matching procedure, as they are conceptually and mechanically related to regulatory fragmentation and may introduce bias into the estimation of the propensity score.

Table 3-7: Propensity Score Matching (PSM)

	(2) Dependent variable = High fragmentation	**(3) Dependent variable = CETR**
Reg_Frag	-	0.389**
		(2.23)
Topic Dis	-	-0.772*
		(-1.88)
Reg Quantity	-	-0.164**
		(-2.50)
MTB	-0.006	-0.001
	(-1.48)	(-1.61)
LEV	-0.004	-0.039***
	(-0.05)	(-3.43)
FI	0.192	0.175*
	(0.31)	(1.87)
PPE	-0.065	-0.099***
	(-0.52)	(-5.66)
INTAN	-0.131	-0.041***
	(-1.23)	(-2.74)
EQUITY	-0.461	0.403
	(-0.08)	(0.56)
RD	-0.797**	-0.320***
	(-2.29)	(-7.45)
ROA	0.146	0.099***
	(0.93)	(5.09)
CNOL	0.005	0.012
	(0.05)	(0.94)
NOL	-0.003	-0.007***
	(-0.25)	(-4.53)
ACCRUALS	0.075	0.058**
	(0.40)	(2.01)
MA SCORE	-0.014	-0.036
	(-0.08)	(-1.47)
SIZE	0.009	0.005***
	(0.72)	(2.63)
CONSTANT	0.194	2.611**
	(0.25)	(2.37)
N	4089	4089
R^2	-	0.154
adj. R^2	-	0.133

Notes: This table presents regression results when employing the Propensity Score Matching approach. All variables are defined in the Appendix. Standard errors are reported in parentheses with standard errors clustered by firm and year. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

The matching procedure is implemented using one-to-one nearest-neighbour matching with replacement and a maximum calliper distance of 0.001. **Table 3-7** presents the regression results based on the matched sample. The results indicate that regulatory fragmentation remains positively and statistically significant in explaining CETR, suggesting that higher fragmentation is associated with lower levels of tax avoidance. These findings are consistent with the baseline results and support the robustness of the main analysis.

To assess the quality of the matching procedure, **Table 3-8** reports covariate balance diagnostics before and after matching. The results indicate that, prior to matching, treated and control firms exhibit noticeable differences across several covariates. However, after matching, these differences are substantially reduced. In particular, the mean standardised bias decreases from 12.3% to 5.4%, and the median bias from 10.0% to 4.6%, indicating a significant improvement in covariate balance.

Table 3-8: Covariate Balance Before and After Matching

Variable	Treated (Before)	Control (Before)	Bias (%) Before	Treated (After)	Control (After)	Bias (%) After
MTB	2.6249	3.1523	-10.0	2.6217	2.2673	6.7
LEV	0.2325	0.3268	-29.8	0.2363	0.2487	-3.9
FI	0.0129	0.0110	5.4	0.0121	0.0129	-2.4
PPE	0.2521	0.2767	-9.9	0.2544	0.2657	-4.6
INTAN	0.1809	0.2274	-19.4	0.1802	0.1741	2.5
EQUITY	0.0005	0.0007	-4.8	0.0005	0.0006	-0.8
RD	0.0420	0.0409	1.3	0.0419	0.0294	15.7
ROA	0.0972	0.0509	22.1	0.0953	0.1124	-8.1
CNOL	0.0355	0.0636	-10.3	0.0367	0.0242	4.6
NOL	0.5142	0.9652	-18.5	0.5208	0.3252	8.0
ACCRUALS	-0.0720	-0.0838	8.3	-0.0724	-0.0633	-6.4
MA_SCORE	-0.0036	-0.0117	6.9	-0.0040	-0.0054	1.2
SIZE	5.9137	6.1941	-13.0	5.8795	5.9866	-5.0

Notes: This table reports covariate balance before and after propensity score matching. Bias (%) represents the standardised mean difference. The results indicate a substantial reduction in covariate imbalance after matching.

Furthermore, most covariates exhibit standardised differences below the conventional threshold of 10% after matching, suggesting that the matching procedure effectively balances observable characteristics between treated and control firms. Consistent with this, Rubin's B statistic decreases from 47.5 to 21.1, while Rubin's R statistic falls within the acceptable range, further confirming the quality of the matching process. In addition, the common support condition is satisfied, as sufficient overlap is observed in the distribution of propensity scores between treated and control firms. This indicates that the matching procedure is not driven by extrapolation and supports the validity of the PSM design. These results suggest that the

matching procedure successfully improves comparability between treated and control firms, reinforcing the credibility of the estimated effects of regulatory fragmentation on corporate tax avoidance.

3.6 Additional Robustness Analysis

3.6.1 Alternative Measure of Tax Avoidance

To ensure the robustness of our main findings, we conduct an additional test employing an alternative measure of tax avoidance. Specifically, we replace the five-year cash effective tax rate (CETR5) used in the baseline regressions with a three-year measure (CETR), which averages firms' cash taxes paid over the shorter period. This alternative specification enables us to verify that the observed relationship is not sensitive to the time horizon selected for measuring tax avoidance. As presented in **Table 3-9**, the results remain consistent with those of the main analysis: Regulatory fragmentation (Reg_Frag) continues to exhibit a positive and statistically significant association with CETR, indicating lower levels of tax avoidance in more fragmented regulatory environments. In Column (1), without control variables, the coefficient on Reg_Frag is 0.732 ($p < 0.01$), while in Column (2), after controlling for firm fundamentals and governance proxies, the effect remains positive and statistically significant at 0.280 ($p < 0.01$). These results reinforce our interpretation that regulatory complexity—arising from inconsistent and overlapping regulatory oversight—acts as a constraint on aggressive tax planning.

Furthermore, the continued statistical significance of control variables such as Topic_Dis and Reg_Quantity reaffirms the robustness of our analytical framework. Overall, this robustness check provides additional empirical support for the conclusion that the negative relationship between regulatory fragmentation and tax avoidance is not merely an artefact of the specific measurement window employed in the CETR calculation.

Table 3-9: Alternative Measure of Tax Avoidance

	(1) CETR	(2) CETR
Reg_Frag	0.732***	0.280***
	(8.63)	(3.33)
Topic_Dis	-1.806***	-0.759***
	(-10.28)	(-4.34)
Reg_Quantity	-0.055*	-0.072**
	(-1.88)	(-2.51)
MTB	-	-0.001***
		(-2.74)

LEV	-	-0.040***
		(-7.96)
FI	-	0.077**
		(1.98)
PPE	-	-0.080***
		(-9.77)
INTAN	-	-0.005
		(-0.81)
EQUITY	-	1.111***
		(3.18)
RD	-	-0.257***
		(-12.16)
ROA	-	0.127***
		(14.23)
CNOL	-	0.011*
		(1.90)
NOL	-	-0.006***
		(-9.68)
ACCRUALS	-	0.030**
		(2.34)
MA_SCORE	-	-0.014
		(-1.28)
SIZE	-	0.005***
		(5.30)
CONSTANT	1.972***	1.561***
	(4.02)	(3.27)
N	19589	19589
Clustering	By firm and year	By firm and year
R^2	0.084	0.146
adj. R^2	0.080	0.142

Notes: This table presents regression results using an alternative measure of tax avoidance (CETR), calculated over a three-year period. The specification mirrors the baseline model in terms of controls and fixed effects. All variable definitions are provided in the Appendix. Standard errors, clustered at the firm-year level, are reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

3.6.2 Alternative Measure of Regulatory Intensity as a Dummy Variable

As an additional robustness check, we examine whether the effect of regulatory fragmentation on corporate tax avoidance varies systematically across firms operating in high versus low regulatory environments. To do so, we transform our measure of regulatory intensity into a binary variable indicating whether a firm is subject to above-median levels of regulatory activity in its industry-year. This dummy-based specification enables a simplified assessment of whether the institutional context—specifically, exposure to particularly dense regulatory oversight—modifies the impact of fragmented governance structures.

Table 3-10: Regulatory Intensity as a Dummy Variable

	(1) **CETR**	**(2)** **CETR**
Reg_Frag	0.707***	0.247***
	(8.29)	(2.92)
Reg In dummy * Reg_Frag	0.021***	0.025***

	(3.94)	(4.98)
Topic_Dis	-1.795***	-0.744***
	(-10.22)	(-4.26)
Reg_Quantity	-0.055*	-0.072**
	(-1.87)	(-2.51)
ROA	-	0.128***
		(14.35)
MTB	-	-0.001***
		(-2.77)
LEV	-	-0.040***
		(-8.04)
FI	-	0.073*
		(1.88)
PPE	-	-0.079***
		(-9.73)
INTAN	-	-0.005
		(-0.81)
EQUITY	-	1.095***
		(3.14)
RD	-	-0.256***
		(-12.13)
CNOL	-	0.011*
		(1.93)
NOL	-	-0.006***
		(-9.71)
ACCRUALS	-	0.030**
		(2.36)
MA_SCORE	-	-0.014
		(-1.28)
SIZE	-	0.005***
		(5.35)
CONSTANT	-0.372***	-0.001
	(-5.47)	(-0.01)
N	19589	19589
Clustering	By firm and year	By firm and year
R^2	0.085	0.147
adj. R^2	0.081	0.143

Notes: This table reports regression results using a dummy variable for regulatory intensity as a moderating factor. The dummy equals 1 if a firm operates in an industry-year with above-median regulatory intensity, based on rule issuance by relevant agencies. All variable definitions are provided in the Appendix. Standard errors are clustered at the firm-year level and reported in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 3-10 presents the results of this analysis. Across both specifications, the interaction between Reg_Frag and the regulatory intensity dummy is positive and statistically significant. This suggests that the compliance burden induced by regulatory fragmentation becomes more effective at curbing tax avoidance when firms operate under generally more active regulatory regimes. In other words, fragmented oversight appears to be more constraining when embedded within a broader regulatory environment that is already characterised by high rule issuance and enforcement. These results remain consistent with the core findings of our study and offer further support for the argument that institutional structures and enforcement dynamics jointly shape firms' tax strategies.

3.7 Further Analysis

3.7.1 Internal Channels

3.7.1.1 Firm Innovation

The study also examines the role of innovation as a key channel influencing the relationship between tax avoidance and regulatory fragmentation. We propose that firms with high levels of innovation engage in less tax avoidance when confronted with regulatory fragmentation—a relationship that can be explained through several theoretical and empirical arguments in prior research.

Highly innovative firms typically foster a culture of creativity that prioritises openness, integrity, and ethical behaviour among employees. Such a culture supports a strategic orientation towards long-term objectives, emphasising the importance of maintaining a strong corporate reputation and achieving sustainable development. Since aggressive tax avoidance practices can undermine a firm's public image, these companies—being acutely aware of stakeholder trust and reputation—tend to refrain from such strategies (Wang et al., 2010). Consequently, highly innovative firms often avoid tax avoidance practices that could jeopardise their long-term interests and reputational capital.

Firms characterised by a creation-oriented approach are generally R&D intensive (Ucar, 2018), aligning their activities with long-term investment and growth strategies rather than short-term financial manipulation. Research shows that R&D expenditure frequently qualifies for tax incentives and credits, designed by governments to stimulate innovation. These legitimate tax advantages reduce the need for additional, aggressive tax avoidance measures (Cameron et al., 2014). In this regard, the availability of lawful tax benefits can lower the incentive for engaging in non-compliant tax strategies, as firms can achieve tax efficiency through legitimate channels (Kerr & Nanda, 2015). Although R&D expenditure can sometimes be employed for earnings management purposes (Roychowdhury, 2006), the costs and risks associated with such practices—including potential damage to financial reporting credibility and diversion of managerial attention—may discourage highly innovative firms from pursuing aggressive tax avoidance (Zang, 2012). Engaging in earnings management requires considerable effort and may distract management from value-enhancing activities, ultimately undermining the firm's long-term innovation capacity (Goldman & Slezak, 2006).

Given that regulatory fragmentation can lead to higher compliance costs and greater regulatory complexity (Kalmenovitz et al., 2022), firms are further disincentivised from engaging in tax

avoidance. Innovative firms, which already face complex operational environments, may prefer to allocate their resources towards innovation and strategic growth rather than navigating the uncertainty and risk associated with tax avoidance in fragmented regulatory systems. Moreover, innovative firms frequently rely on institutional support and maintain close relationships with regulators. Such firms may consciously avoid aggressive tax strategies to preserve favourable governmental relationships and to continue receiving regulatory incentives that support their innovative endeavours. Maintaining a cooperative stance towards regulators can ensure continued access to these benefits while reducing the likelihood of regulatory backlash or legal sanctions (Aghion et al., 2005).

Thus, firms with high levels of innovation are likely to engage in less tax avoidance when faced with regulatory fragmentation due to a combination of factors: a creative and ethical corporate culture, access to legitimate tax incentives, aversion to compliance complexity, and the strategic need to sustain strong institutional relationships. Collectively, these factors should contribute to a reduced propensity for tax avoidance among highly innovative firms operating in fragmented regulatory environments.

The regression analysis presented in **Table 3-11** provides a comparative assessment of the influence of regulatory fragmentation on firms' tax avoidance behaviour, stratified by their level of innovation. Following Li et al. (2021), we measure creative corporate culture using indicators derived from textual analysis of conference call transcripts, focusing specifically on linguistic markers associated with innovation-oriented culture.

As shown in **Table 3-11**, firms in the top quartile of innovation exhibit a strong positive association between regulatory fragmentation (Reg_Frag) and the cash effective tax rate (CETR), indicating that increased regulatory fragmentation corresponds to a reduction in tax avoidance. This finding implies that innovative firms—likely subject to greater stakeholder scrutiny and reputational sensitivity—tend to exhibit more compliant tax behaviour in complex regulatory environments.

Table 3-8: Regulatory Fragmentation, Tax Avoidance, and Firm Innovation

	(1) Firm Innovation - High CETR	(2) Firm Innovation - Low CETR
Reg _Frag	1.175***	-0.132
	(0.226)	(0.207)
Innovation	-0.002	-0.010
	(0.002)	(0.006)
Topic _Dis	-0.848*	0.729*

	(0.434)	(0.425)
Reg _Quantity	0.119	0.128*
	(0.079)	(0.077)
MTB	0.000	0.001
	(0.001)	(0.001)
LEV	-0.025*	-0.020
	(0.015)	(0.016)
FI	-0.322***	0.120
	(0.084)	(0.098)
PPE	-0.034	-0.138***
	(0.024)	(0.018)
INTAN	-0.023	-0.046**
	(0.015)	(0.018)
EQUITY	3.429***	-0.021
	(1.117)	(0.673)
RD	-0.332***	-0.252***
	(0.052)	(0.096)
ROA	0.112***	0.091***
	(0.028)	(0.035)
CNOL	-0.012	0.100***
	(0.019)	(0.027)
NOL	-0.030***	-0.049***
	(0.004)	(0.006)
ACCRUALS	0.060	-0.005
	(0.040)	(0.044)
MA_SCORE	-0.008	-0.058**
	(0.025)	(0.029)
SIZE	0.001	-0.001
	(0.002)	(0.002)
_cons	-1.353	-1.569
	(1.249)	(1.253)
R^2	0.187	0.180
Clustering	By firm and year	By firm and year
F	9.687	7.879
N	**3701**	**3353**

Notes: Columns (1) and (2) report the results from OLS regressions of the association between regulatory fragmentation and tax avoidance influenced by varying levels of firm innovation. Column (1) of this table reports the results in firms with the highest innovation. Column (2) of this table reports the results in firms with lowest innovation. Robust z-statistics are in brackets and are based on standard errors that are clustered by firm. ***p < 0.01, **p < 0.05, *p < 0.10. Refer to the Appendix for variable definitions.

Conversely, for firms in the lowest 25% for innovation, there is no significant association between regulatory fragmentation and CETR. This could suggest that less innovative firms are either unaffected by regulatory fragmentation in their tax avoidance decisions or that any potential effects are overshadowed by other factors.

The contrasting coefficients for Topic_Dis, indicating a negative relationship with CETR for highly innovative firms and a positive relationship for less innovative firms, highlight how the dispersion of topics among regulatory agencies might affect firms differently based on their innovative capacity. For highly innovative firms, which may navigate complex regulatory structures more effectively, increased topic dispersion could facilitate strategic tax planning. In

contrast, less innovative firms might find increased dispersion challenging, leading to reduced opportunities or capabilities for tax avoidance.

3.7.1.2 Managerial Ability

The research further investigates how managerial ability significantly affects the interplay between tax avoidance and regulatory fragmentation. We contend that the effectiveness of management significantly influences the extent to which regulatory fragmentation affects a company's tax avoidance practices. This is clearly supported by the regression outcomes shown in **Table 3-12**, where the analysis is segmented by high and low levels of managerial ability, as indicated by the MA_SCORE.

Regulatory fragmentation, which involves diverse and sometimes contradictory regulations across various regions, demands a detailed comprehension for effective management. Managers with high ability have the cognitive skills and experience needed to interpret and navigate these complex regulatory landscapes. They can craft sophisticated strategies that both ensure compliance and optimise tax outcomes (Dyreng et al., 2010). In contrast, managers with lower ability may struggle with these complexities, resulting in less effective tax planning and a higher propensity for reactive tax avoidance. Moreover, superior managerial ability is correlated with better strategic planning and execution. Skilled managers can anticipate regulatory changes and adapt their tax strategies accordingly. They excel at leveraging legal loopholes and structuring transactions to minimise tax liabilities without engaging in legally questionable tax avoidance (Desai & Dharmapala, 2006).

Effective tax planning in the context of regulatory fragmentation requires considerable resources and strong risk management. Managers with high ability tend to excel at efficiently allocating resources and managing the risks arising from aggressive tax avoidance strategies. They can weigh the potential benefits of tax savings against the risks of penalties and reputational harm (Gupta & Newberry, 1997). In comparison, managers with lesser ability might struggle with these balanced decisions, leading to either excessive conservatism (missing potential tax benefits) or over-aggressiveness (engaging in risky tax avoidance schemes). Managerial ability also correlates with innovation and adaptability. High-ability managers tend to stay current with the latest developments in tax law and accounting practices, enabling them to create tax strategies that are both compliant and optimised for the firm's financial health (Hanlon & Heitzman, 2010). This is supported by our findings in Section 3.4.2, which indicate that innovative firms engage in tax avoidance less when they find themselves in complex regulatory landscapes, as they may focus on value-added activities rather than tax avoidance.

Firms with less capable managers may lack this innovative edge, making it harder to adapt to regulatory fragmentation, leading them to rely more on straightforward tax avoidance measures.

In accordance with these arguments, studies have shown that firms with higher managerial ability exhibit better financial performance and more effective risk management and are more likely to engage in tax planning than tax avoidance (Baik et al., 2011). For instance, research has demonstrated that managerial ability is positively associated with the firm's overall compliance with regulations and negatively associated with the likelihood of engaging in aggressive tax avoidance practices (Dyreng et al., 2010). In conclusion, managerial ability has a significant influence on how firms respond to regulatory fragmentation. High-ability managers are better equipped to navigate complex regulatory environments, develop sophisticated and compliant tax strategies, allocate resources efficiently, manage risks effectively, and uphold high ethical standards. Therefore, it is reasonable to expect that the impact of regulatory fragmentation on tax avoidance is more pronounced in firms with lower managerial ability, as their limited capacity to develop and implement effective tax strategies can lead them to resort to tax avoidance as a coping mechanism.

Further empirical evidence (Baik et al., 2011) also indicates that firms with higher managerial ability demonstrate superior financial performance and more effective risk management, showing a proclivity for engaging in tax planning over tax avoidance. More specifically, research reveals a positive correlation between managerial ability and a firm's overall regulatory compliance, and a negative correlation with the propensity for aggressive tax avoidance practices (Dyreng et al., 2010).

Table 3-9: Regulatory Fragmentation, Tax Avoidance, and Managerial Ability

	(1) High Managerial CETR	(2) Low Managerial CETR	(3) High Managerial CETR	(4) Low Managerial CETR
Reg _Frag	0.209*	0.317**	0.213*	0.318**
	(0.124)	(0.125)	(0.125)	(0.125)
MA_SCORE	-	-	-0.026	-0.016
			(0.017)	(0.052)
Topic _Dis	-0.570**	-0.233	-0.550**	-0.232
	(0.230)	(0.247)	(0.231)	(0.247)
Reg _Quantity	-0.004	0.021	-0.005	0.021
	(0.041)	(0.043)	(0.041)	(0.043)
MTB	-0.001***	-0.001**	-0.001**	-0.001**
	(0.000)	(0.001)	(0.000)	(0.001)
LEV	-0.024***	-0.053***	-0.024***	-0.052***
	(0.009)	(0.010)	(0.009)	(0.010)
FI	-0.076	-0.022	-0.082	-0.022
	(0.051)	(0.065)	(0.051)	(0.065)
PPE	-0.092***	-0.078***	-0.094***	-0.079***

	(0.012)	(0.013)	(0.012)	(0.013)
INTAN	-0.017*	-0.034***	-0.018*	-0.034***
	(0.010)	(0.011)	(0.010)	(0.011)
EQUITY	-0.457	0.792*	-0.476	0.789*
	(0.510)	(0.470)	(0.515)	(0.470)
RD	-0.286***	-0.375***	-0.278***	-0.373***
	(0.032)	(0.050)	(0.033)	(0.051)
ROA	0.120***	0.115***	0.124***	0.117***
	(0.016)	(0.022)	(0.017)	(0.023)
CNOL	0.034***	0.033**	0.037***	0.033**
	(0.012)	(0.015)	(0.012)	(0.015)
NOL	-0.038***	-0.042***	-0.039***	-0.042***
	(0.002)	(0.003)	(0.002)	(0.003)
ACCRUALS	0.046**	0.061**	0.052**	0.061**
	(0.021)	(0.025)	(0.021)	(0.025)
SIZE	-0.002**	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.002)
_cons	0.904	0.087	0.890	0.085
	(0.655)	(0.700)	(0.659)	(0.700)
R^2	0.179	0.134	0.178	0.134
Clustering	By firm and year	By firm and year	By firm and year	By firm and year
F	22.209	16.417	21.619	16.251
N	9899	10505	9775	10505

Notes: Columns (1) and (2) report the results from OLS regressions of the association between regulatory fragmentation and tax avoidance influenced by varying levels of managerial ability (MA_SCORE). Column (1) reports the firms with high managerial ability (MA_SCORE) while Column (2) reports the firms with low managerial ability (MA_SCORE). Columns (3) and (4) report the same results as in (1) and (2) but after controlling for MA_SCORE. Robust z-statistics are in brackets and are based on standard errors that are clustered by firm. ***p < 0.01, **p < 0.05, *p < 0.10. Refer to the Appendix for variable definitions.

These findings underscore the significant role of managerial ability in shaping firms' responses to regulatory fragmentation. High-ability managers possess the skills necessary to navigate complex regulatory landscapes, devise sophisticated and compliant tax strategies, allocate resources judiciously, manage risks effectively, and uphold ethical standards. Consequently, it is reasonable to conclude that the impact of regulatory fragmentation on tax avoidance is more pronounced in firms with lower managerial ability. The analysis presented in **Table 3-12** offers a comparative examination of how regulatory fragmentation influences corporate tax avoidance, differentiated by levels of managerial ability. To assess managerial ability, we employ MA_SCORE as formulated by Demerjian et al. (2013), which gauges the efficiency with which managers allocate their firm's resources. Typically, firms deploy capital, labour, and innovative assets to generate income. Managers of higher calibre tend to achieve superior output levels from these resources by implementing advanced business systems and processes, such as optimised supply chains and effective compensation structures.

Our findings indicate that companies with greater managerial ability—see Columns (1) and (3)—engage in less tax avoidance, as indicated by less negative coefficients for CETR, compared to those with lower managerial capability—see Columns (2) and (4). This implies that skilled managers might utilise more efficient and ethical management approaches, even in

fragmented regulatory landscapes, thereby diminishing the propensity for aggressive tax practices. Additionally, the impact of regulatory fragmentation on tax avoidance is shown to be more pronounced in firms with lower managerial ability. The coefficients for Reg_Frag in these firms are more negative, suggesting that in the absence of strong managerial oversight, regulatory fragmentation may indeed lead to higher tax avoidance. This provides empirical support for the hypothesis that managerial ability not only influences overall firm performance but also plays a central role in mediating the effects of regulatory policies on tax practices. By understanding these dynamics, policymakers can better design regulations that minimise unintended consequences while promoting fair and effective tax compliance.

3.7.1.3 The Influence of CEO Characteristics

In **Table 3-13**, we extend our empirical model by incorporating CEO-specific characteristics—namely age, gender, and tenure—as moderating variables to understand better the dynamics between regulatory fragmentation and corporate tax avoidance. Given the central role that CEOs play in shaping firm strategies, prior research highlights that their demographic and professional traits can significantly influence managerial decision-making, including tax planning behaviours (Bertrand & Schoar, 2003; Huang & Kisgen, 2013). By integrating these variables into our regression framework, we assess whether the relationship between regulatory fragmentation and tax avoidance is conditioned by the individual who leads the firm.

Table 3-10: The Influence of CEO's Age, Gender, and Tenure

	(1) **CETR**	**(2)** **CETR**	**(3)** **CETR**
Reg _Frag	-0.335	0.461**	0.552***
	(-1.09)	(2.30)	(4.23)
AGE	-0.009**	-	-
	(-2.12)		
Reg _Frag * AGE	**0.012****	-	-
	(2.29)		
Gender	-	0.100	-
		(0.66)	
Reg_Frag * Gender	-	**-0.117**	-
		(-0.61)	
CEO_ tenure	-	-	0.011***
			(2.76)
Reg_Frag * CEO tenure	-	-	**-0.013*****
			(-2.68)
Topic_Dis	-0.076	-0.105	-0.036
	(-0.44)	(-0.64)	(-0.19)
Reg_Quantity	-0.006	-0.016	-0.027
	(-0.22)	(-0.61)	(-0.86)
ROA	0.095***	0.098***	0.094***
	(6.05)	(6.43)	(4.98)
MTB	-0.000	-0.000	0.000

	(-0.35)	(-0.71)	(0.51)
LEV	-0.044***	-0.043***	-0.047***
	(-7.16)	(-7.21)	(-6.43)
FI	-0.076*	-0.087**	-0.101**
	(-1.92)	(-2.26)	(-2.10)
PPE	-0.077***	-0.078***	-0.090***
	(-8.39)	(-8.82)	(-8.77)
INTAN	-0.013*	-0.016**	-0.019**
	(-1.78)	(-2.31)	(-2.35)
EQUITY	0.530	0.631*	0.581
	(1.39)	(1.76)	(1.34)
RD	-0.365***	-0.373***	-0.397***
	(-10.58)	(-11.11)	(-9.65)
CNOL	0.032**	0.033**	0.024
	(2.25)	(2.36)	(1.32)
NOL	-0.022***	-0.022***	-0.019***
	(-8.74)	(-8.93)	(-6.29)
ACCRUALS	0.077***	0.075***	0.064***
	(3.67)	(3.76)	(2.62)
MA_SCORE	-0.035***	-0.037***	-0.034***
	(-3.14)	(-3.49)	(-2.79)
SIZE	-0.003**	-0.002**	-0.004***
	(-2.53)	(-1.98)	(-2.59)
CONSTANT	0.675	0.216	0.227
	(1.28)	(0.46)	(0.42)
N	15329	16437	11098
R^2	0.130	0.128	0.136
Clustering	Firm/ year	Firm/ year	Firm/ year
adj. R^2	0.124	0.123	0.128

Notes: Column (1) presents the baseline regression assessing the introduction of CEO gender and its interaction with regulatory fragmentation (Reg_Frag) on tax avoidance (CETR). Column (2) introduces CEO gender and its interaction with Reg_Frag to test moderating effects. Column (3) incorporates CEO tenure and its interaction with Reg_Frag to evaluate whether tenure influences the relationship between regulatory fragmentation and tax avoidance. All models include standard firm-level controls and year-fixed effects. Robust standard errors are reported in parentheses.

The results indicate that regulatory fragmentation continues to exhibit a statistically significant association with tax avoidance outcomes. Notably, CEO tenure emerges as a significant moderating factor, amplifying the effect of fragmentation on increased tax avoidance, whereas age and gender demonstrate limited moderating influence. These findings underscore the importance of leadership characteristics in mediating institutional effects, suggesting that long-serving CEOs may be better positioned to navigate complex regulatory environments and optimise tax strategies.

The regression results presented in **Table 3-13** examine the moderating effects of these CEO characteristics—specifically age, gender, and tenure—on the relationship between regulatory fragmentation (Reg_Frag) and corporate tax avoidance, measured by the cash effective tax rate (CETR). A positive CETR coefficient corresponds to lower tax avoidance, whereas a negative coefficient indicates higher tax avoidance.

In Model (1), regulatory fragmentation is negatively associated with CETR but not statistically significant, suggesting that, in this specification, fragmentation does not exert a meaningful direct effect on tax avoidance. However, the interaction between Reg_Frag and CEO age is positive and statistically significant ($p < 0.05$), implying that older CEOs strengthen the negative relationship between regulatory fragmentation and tax avoidance. This finding may reflect greater risk aversion and a stronger compliance orientation among more experienced executives (Serfling, 2014).

In Model (2), regulatory fragmentation is significantly and positively associated with CETR ($p < 0.05$). The interaction between Reg_Frag and CEO gender is negative but statistically insignificant, indicating that gender does not materially influence how regulatory fragmentation affects corporate tax behaviour.

In Model (3), regulatory fragmentation remains positively and significantly associated with CETR ($p < 0.01$), while the interaction between Reg_Frag and CEO tenure is negative and statistically significant ($p < 0.01$). This suggests that longer-serving CEOs leverage their firm-specific knowledge and established authority to attenuate the constraining effect of regulatory fragmentation, thereby facilitating more aggressive tax strategies. This outcome aligns with the literature on CEO entrenchment, which posits that longer tenures can afford executives greater discretion over strategic and financial decision-making (Bertrand & Schoar, 2003; Huang & Kisgen, 2013).

Overall, the findings highlight that CEO age and tenure, but not gender, play meaningful roles in shaping how firms respond to fragmented regulatory environments in their tax planning decisions. This underscores the behavioural dimension of corporate tax strategy, illustrating how executive characteristics can indeed influence the extent to which institutional constraints translate into compliance or tax avoidance behaviour.

3.7.1.4 The Mediating Effect of Financial Constraints and Performance

Previous research, as mentioned, has examined the relationship between financial constraints and tax avoidance, as well as the link between firm performance and tax avoidance. Specifically, studies have shown that financially constrained firms are more likely to engage in tax avoidance strategies as a means of alleviating financial pressure (Hanlon & Heitzman, 2010). This implies that firms experiencing fewer financial constraints may be less inclined to undertake tax avoidance activities. Furthermore, tax avoidance tends to be discouraged by higher profitability, as more profitable firms are less likely to pursue aggressive tax planning.

Instead, such firms often prioritise sustainable growth and value-enhancing investments, rather than diverting potential savings from tax avoidance into activities that may diminish long-term value (Katz et al., 2013).

If regulatory fragmentation influences both financial constraints and firm profitability, it logically follows that such fragmentation may also exert an indirect effect on tax avoidance through these channels. What remains uncertain, however, is the extent to which regulatory fragmentation indirectly shapes corporate tax avoidance via its effects on financial constraints and profitability. Addressing this gap provides an opportunity to identify the mechanisms through which tax avoidance is influenced, therein clarifying the underlying pathways driving corporate tax behaviour.

To investigate this relationship, we employ path analysis, following a methodology proposed by Wright (1934). Specifically, our analysis examines the size-age index (SA-index) and return on assets (ROA) as potential mediating variables linking regulatory fragmentation (Reg_Frag) to tax avoidance. This is operationalised through a structural equation model (SEM), which captures both the direct effect of regulatory fragmentation on tax avoidance and its indirect effects through the mediating factors. The SEM framework comprises two regression equations: the first estimates the relationship between tax avoidance, regulatory fragmentation, and the mediators (SA-index and ROA); the second examines the relationship between the mediators and tax avoidance. All regressions incorporate the control variables employed in the main analysis.

The indirect effect of regulatory fragmentation on tax avoidance is computed as the product of its effect on the mediating variables (SA-index and ROA) and the corresponding effect of these mediators on tax avoidance. To assess the statistical significance of these indirect effects, we apply Sobel's test statistic (Sobel, 1982).

Financial constraints are identified using the SA-index, calculated in accordance with Whited and Wu (2006) and Hadlock and Pierce (2010). As per Hadlock and Pierce (2010), the SA-index is derived from firm size (total assets) and firm age, where higher index values indicate greater financial constraint. ROA is used as a measure of firm performance (Rego, 2003; Chen et al., 2010). A detailed description of the construction of these variables is provided in the Appendix.

The results reported in **Table 3-14** demonstrate substantial indirect effects of regulatory fragmentation on tax avoidance through both mediating variables. Specifically, regulatory fragmentation negatively affects the SA-index, with a coefficient of -0.467, while tax avoidance

is negatively influenced by the SA-index, with a coefficient of -0.0267; both coefficients are statistically significant. Furthermore, the indirect coefficient of regulatory fragmentation on tax avoidance via the SA-index is 0.564, which is also statistically significant. Comparable results are obtained when ROA is employed as a mediating variable. Collectively, these findings support our argument that regulatory fragmentation indirectly influences tax avoidance through its impact on both financial constraints and firm performance. Accordingly, the SA-index and ROA serve as important conduits through which regulatory fragmentation affects corporate tax behaviour.

For further clarification, Column (2) of **Table 3-14** presents the mediating effect of financial constraint, represented by the SA-index, on the relationship between regulatory fragmentation (Reg_Frag) and corporate tax avoidance (CETR). The negative and statistically significant coefficient of Reg_Frag (-0.467***) in Column (2) suggests that increased regulatory fragmentation alleviates financial constraint. This finding is consistent with our argument that regulatory fragmentation can mitigate financial limitations by affording firms greater flexibility in managing their tax obligations. Consequently, reduced financial constraint may diminish firms' propensity to engage in tax avoidance, as they experience less pressure to adopt aggressive tax planning strategies.

Column (5) of the same table examines the effect of regulatory fragmentation on firm performance, measured by the return on assets (ROA). The positive and statistically significant coefficient of Reg_Frag (0.267***) indicates that regulatory fragmentation enhances firm performance. This result supports the proposition that higher profitability—stemming from improved operational performance—discourages aggressive tax avoidance behaviour.

Table 3-14: The Mediating Effect of Financial Constraints and Performance

	A			B		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	(path c)	**(path a)**	**(b and c)**	**(path c)**	**(path a)**	**(b and c)**
	CETR	**SA_ index**	**CETR**	**CETR**	**ROA**	**CETR**
Reg_Frag	0.576***	-0.467***	0.564***	0.533***	0.267***	0.494***
	(0.053)	(0.092)	(0.053)	(0.052)	(0.028)	(0.052)
SA_index	-	-	-0.024***	-	-	-
			(0.004)			
ROA	0.119***	-0.478***	0.110***	-	-	0.145***
	(0.012)	(0.020)	(0.012)			**(0.013)**
Topic_Dis	0.117	1.130***	0.144	-0.009	0.286***	-0.051
	(0.139)	(0.242)	(0.139)	(0.138)	(0.073)	(0.137)
Reg_Quantity	-0.034***	-0.133***	-0.037***	-0.034***	-0.026***	-0.030***
	(0.009)	(0.016)	(0.009)	(0.009)	(0.005)	(0.009)
MTB	-0.001**	0.001	-0.001**	-0.001	0.005***	-0.001***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)

LEV	-0.042***	0.147***	-0.039***	-0.041***	-0.074***	-0.030***
	(0.007)	(0.011)	(0.007)	(0.006)	(0.003)	(0.006)
FI	0.023	-0.624***	0.008	-0.024	0.705***	-0.126***
	(0.039)	(0.067)	(0.039)	(0.038)	(0.019)	(0.039)
PPE	-0.085***	0.011	-0.085***	-0.096***	0.073***	-0.107***
	(0.007)	(0.012)	(0.007)	(0.007)	(0.003)	(0.007)
INTAN	-0.021***	0.026***	-0.020***	-0.035***	0.083***	-0.047***
	(0.007)	(0.012)	(0.007)	(0.007)	(0.003)	(0.007)
EQUITY	0.142	0.094	0.144	0.293	1.273***	0.109
	(0.344)	(0.598)	(0.343)	(0.343)	(0.180)	(0.342)
RD	-0.483***	0.438***	-0.473***	-0.447***	-0.329***	-0.399***
	(0.025)	(0.043)	(0.025)	(0.024)	(0.013)	(0.025)
CNOL	-0.005	0.101***	-0.002	0.021***	-0.158***	0.044***
	(0.009)	(0.017)	(0.009)	(0.009)	(0.005)	(0.010)
NOL	-0.046***	0.026***	-0.046***	-0.049***	-0.043***	-0.043***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)
ACCRUALS	0.137***	-0.262***	0.131***	0.109***	0.308***	0.064***
	(0.0149)	(0.026)	(0.015)	(0.015)	(0.008)	(0.016)
MA_SCORE	0.030***	0.361***	0.039***	0.009	0.237***	-0.025**
	(0.011)	(0.020)	(0.012)	(0.011)	(0.006)	(0.012)
SIZE	-0.003***	-0.217***	-0.009***	-0.003***	-0.003***	-0.003***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)
_cons	0.160	-1.596***	0.122	0.311	-0.086	0.323
	(0.199)	(0.348)	(0.199)	(0.198)	(0.104)	(0.197)
R^2	0.112	0.620	0.1139	0.113	0.476	0.119
F	168.16	2174.29	160.13	173.67	1230.19	171.205
N	19946	19946	19946	20281	20281	20281

Notes: Columns (1), (2), and (3) in this table explain the effect of financial constraints (SA_ index) as a mediating variable on the relationship between regulatory fragmentation and corporate tax avoidance. Columns (4), (5), and (6) describe the same relationship but using the mediating effect of firm performance, which is represented by return on assets (ROA).

A- Sobel-Goodman Mediation Tests

	Est	Std err	z	P> |z|
Sobel	0.006	0.002	2.690	0.007
Aroian	0.006	0.002	2.647	0.008
Goodman	0.006	0.002	2.734	0.006

A- Indirect, Direct, and Total Effects

	Est	Std err	z	P> |z|
a_ coefficient	-0.311	0.091	-3.410	0.001
b_ coefficient	-0.018	0.004	-4.375	0.000
Indirect _effect_ a X b	0.006	0.002	2.690	0.007
Direct_ effect_ c'	0.531	0.053	10.015	0.000
Total_ effect_ c	0.537	0.053	10.119	0.000

B- Sobel-Goodman Mediation Tests

	Est	Std err	z	P> |z|
Sobel	0.039	0.005	7.239	0.000
Aroian	0.039	0.005	7.222	0.000
Goodman	0.039	0.005	7.256	0.000

B- Indirect, Direct, and Total Effects

	Est	Std err	z	P> |z|
a_ coefficient	0.267	0.028	9.676	0.001
b_ coefficient	0.145	0.013	10.911	0.000
Indirect _effect_ a X b	0.039	0.005	7.239	0.007
Direct_ effect_ c'	0.494	0.052	9.425	0.000
Total_ effect_ c	0.533	0.052	10.159	0.000

Firms with stronger profitability tend to emphasise sustainable growth and value-enhancing initiatives rather than engaging in tax avoidance activities that may entail substantial costs, risks, and administrative complexity.

Taken together, these results reinforce the argument that regulatory fragmentation indirectly affects corporate tax avoidance through its influence on financial constraints and firm profitability. Reduced financial constraints lessen the necessity for tax avoidance, while enhanced performance further deters aggressive tax planning. These findings align with the broader hypothesis that regulatory fragmentation influences tax avoidance by reshaping firms' financial conditions and performance dynamics.

3.7.2 External Channels

In addition to this internal evidence presented we also explore the impact of external channels influencing the relationship between tax avoidance and regulatory fragmentation. In particular we examine the impact of external factors such as local creative culture and religion.

3.7.2.1 Local Creative Culture

Prior research has examined the influence of local creative culture on firm behaviour, revealing substantial effects on corporate practices. For instance, Ucar (2018) provides empirical evidence demonstrating that firms located in regions with a high concentration of creative professionals are more likely to engage in innovative activities. The study's findings indicate

that firms operating in areas characterised by a robust creative culture—measured by the proportion of the creative class—produce a greater number of patents and patent citations. These results underscore the significant role of local creative culture in fostering corporate innovation and highlight the importance of the creative environment in promoting innovative outcomes.

Table 3-15: The Effect of LCC

	(1) High Local Creative Culture CETR	(2) Low Local Creative Culture CETR
Reg_Frag	0.670***	0.008
	(0.134)	(0.135)
CSHARE	-0.146***	-0.207***
	(0.042)	(0.080)
Topic_Dis	-1.233***	0.161
	(0.258)	(0.255)
Reg_Quantity	-0.004	-0.015
	(0.044)	(0.045)
MTB	-0.000	-0.001***
	(0.000)	(0.000)
LEV	-0.025***	-0.058***
	(0.007)	(0.009)
FI	-0.158***	0.222***
	(0.054)	(0.072)
PPE	-0.075***	-0.081***
	(0.013)	(0.012)
INTAN	-0.016*	-0.013
	(0.009)	(0.010)
EQUITY	1.156**	-0.066
	(0.493)	(0.467)
RD	-0.302***	-0.228***
	(0.030)	(0.056)
ROA	0.137***	0.108***
	(0.016)	(0.018)
CNOL	0.014**	-0.007
	(0.007)	(0.010)
NOL	-0.013***	-0.017***
	(0.002)	(0.002)
ACCRUALS	0.029*	0.049**
	(0.016)	(0.020)
MA_SCORE	-0.018	-0.047**
	(0.017)	(0.019)
SIZE	0.001	0.001
	(0.001)	(0.001)
_cons	1.039	0.422
	(0.718)	(0.717)
R^2	0.150	0.142
Clustering	By firm and year	By firm and year
F	17.843	14.783
N	10013	8953

Notes: Columns (1) and (2) report the results from OLS regressions of the association between regulatory fragmentation and tax avoidance influenced by varying levels of local creative culture (CSHARE). Column (1) reports the results in firms with high CSHARE. Column (2) reports the results in firms with low CSHARE. Robust z-statistics are in brackets and are based on standard errors clustered by firm. *** p < 0.01, ** p < 0.05, * p < 0.10. Refer to the Appendix for the variable definitions.

Building on this evidence, we argue that local creative culture represents an important channel influencing the relationship between regulatory fragmentation and tax avoidance. This is because local creative culture fosters an environment that values innovation, openness, and ethical standards over aggressive tax avoidance practices. Consequently, firms in such environments are likely to engage in tax avoidance less when confronted with greater regulatory fragmentation, choosing instead to focus on value-enhancing activities that contribute to sustainable long-term performance (Goldman & Slezak, 2006).

To capture this effect empirically, we utilise the proportion of the local creative class, as proposed by Leuenberger and Kluver (2006), who emphasise its importance in shaping regional creative culture. We obtain the CSHARE data from the Economic Research Service (ERS), which provides county-level data on the composition of the creative class and its occupational distributions. According to the ERS, this class includes occupations that demand high levels of creative thinking and problem-solving, including those in architecture, engineering, arts, design, entertainment, sports, media, business and financial operations, computing and mathematics, and management, among others (see the Appendix for further details).

Evidence of this moderating effect is presented in **Table 3-15**. The results reported in Column (1) show that the coefficient for regulatory fragmentation (Reg_Frag) is positive and statistically significant, suggesting that in areas with a high prevalence of creative culture, regulatory fragmentation has a pronounced effect on firms' tax avoidance behaviour. This finding aligns with prior studies that associate creative environments with enhanced corporate innovation and governance quality. Regions rich in creative talent foster workforces requiring creativity and analytical thinking, characteristics that may translate into stronger ethical standards and more transparent business conduct. Indeed, Florida (2002) posits that regions abundant in creative capital tend to encourage progressive business practices, including ethical governance and transparency—factors that may extend to corporate tax behaviour. This perspective helps explain the less aggressive tax avoidance (indicated by a higher CETR) observed among firms located in creative regions, as these organisations may assimilate to the socio-cultural norms of their local environment, which prioritise innovation and perhaps responsibility over exploitation.

By contrast, Column (2), which examines firms situated in areas with low local creative culture, shows that regulatory fragmentation does not significantly influence tax avoidance. The non-significant coefficient for Reg_Frag in this model suggests that firms in such environments are

less shaped by the socio-cultural norms of innovation and transparency, and thus their tax behaviour appears unaffected by variations in regulatory fragmentation.

3.7.2.2 Social Capital and Religion

Another external environmental factor to consider is religion. Prior studies have argued that religiosity significantly influences corporate behaviour, especially in terms of ethical and moral decisions like tax compliance. Boone et al. (2013) reveal that companies located in more religious U.S. counties are less prone to aggressive tax avoidance, indicating that greater religiosity correlates with less risky tax strategies. This supports the idea that religious values encourage honesty and ethical conduct, thereby discouraging avoidance practices. Cho and Yoon (2020) observe that religious uniformity among board members can reduce tax avoidance, as shared religious principles may enhance ethical oversight and decision-making within companies. Similarly, Stack and Kposowa (2006) find that higher individual religiosity is negatively associated with the acceptance of tax fraud across various countries, supporting the moral community hypothesis that strong religious communities are linked to lower rates of tax fraud.

Table 3-16: The Moderating Effect of Social Capital and Religion

	(2) Dependent variable = CETR	**(3) Dependent variable = CETR**
Reg _Frag	-0.342	0.311
	(-0.96)	(0.45)
CSHARE		
	-	-
Reg_Frag * CSHARE		
	-	-
Soc Capital	-0.033	
	(-0.19)	-
Reg_Frag * Soc Capital	0.009	
	(0.04)	-
RELIG	-	0.001
		(0.90)
Reg_Frag * RELIG	-	-0.001
		(-0.85)
Topic_Dis	-2.470**	-2.330**
	(-2.43)	(-2.41)
Reg_Quantity	-0.536***	-0.509***
	(-3.67)	(-3.77)
MTB	-0.000	-0.000
	(-0.24)	(-0.53)
LEV	-0.005	-0.008
	(-0.26)	(-0.44)
FI	-0.054	-0.060
	(-0.28)	(-0.32)
PPE	-0.076**	-0.083**
	(-2.14)	(-2.58)

INTAN	-0.063*	-0.063*
	(-1.84)	(-1.83)
EQUITY	-2.120	-1.422
	(-1.48)	(-1.09)
RD	-0.396***	-0.409***
	(-5.88)	(-6.06)
ROA	0.027	0.054*
	(0.77)	(1.66)
CNOL	0.002	0.001
	(0.12)	(0.04)
NOL	-0.012***	-0.009***
	(-3.46)	(-2.73)
ACCRUALS	0.089*	0.054
	(1.65)	(1.11)
MA_SCORE	-0.008	-0.019
	(-0.18)	(-0.47)
SIZE	0.003	0.003
	(0.63)	(0.72)
CONSTANT	9.258***	8.249***
	(3.66)	(3.39)
N	1017	1068
Clustering	Firm/ year	Firm/ year
R^2	0.263	0.270
adj. R^2	0.201	0.211

Notes: This table reports OLS regression results assessing the moderating effects of local creative culture in Column (1), social capital in Column (2), and religion in Column (3) on the relationship between regulatory fragmentation and CETR. All variables are defined in the Appendix. Standard errors are reported in parentheses with standard errors clustered by firm and year. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

In scenarios of regulatory fragmentation, which can lead to complexities and opportunities for tax avoidance, the presence of strong religious norms and communities may serve as a mitigating factor. Religiosity can influence corporate culture and governance structures to encourage compliance and decrease the incentives to exploit regulatory loopholes; this notion is supported by (Wang & Lu, 2021), who report that firms located in regions with strong Buddhist and Taoist influences in China showed better tax compliance. This implies that religious environments can play a significant role in reducing tax avoidance behaviour. Clearly, the literature supports our assumption that religiosity can significantly impact tax avoidance in fragmented regulatory environments. Companies in highly religious areas are less likely to engage in tax avoidance due to the ethical and moral constraints imposed by religious values. This highlights the role of religion as a crucial social and ethical regulator, complementing regulatory efforts to ensure tax compliance.

We sourced the data on local religious practices from the work of Boone et al. (2013), utilising surveys administered by the Association of Religion Data Archives (ARDA)[11]. The variable of interest, religion (RELIG), quantifies the percentage of a county's population that declares an

[11] https://www.thearda.com

affiliation with an organised religious body for a particular year, as recorded by the ARDA surveys[12]. Prior literature has suggested that higher levels of religious adherence can foster an environment discouraging unethical behaviour and promoting social norms that could extend to corporate governance practices (Hilary & Hui, 2009; McGuire et al., 2012). This moral dimension may amplify the effect of regulatory fragmentation on tax avoidance.

Another external environmental factor that may influence corporate tax behaviour is social capital, which reflects the density of social networks, levels of trust, and cooperative norms within a community, all of which can shape firms' ethical standards and decision-making processes. Prior research suggests that communities characterised by higher levels of social capital foster collective norms of trust and reciprocity, hence discouraging opportunistic behaviours such as aggressive tax avoidance (Putnam, 1995; Knack & Keefer, 1997). For instance, Jha and Chen (2015) find that firms headquartered in U.S. counties with greater social capital demonstrate higher financial reporting quality, implying that strong community norms constrain managerial discretion in ways consistent with broader social and ethical expectations. In this respect, social capital can function similarly to religiosity, reinforcing informal governance mechanisms that complement formal regulatory systems.

In fragmented regulatory environments—where multiple agencies oversee overlapping jurisdictions—both social capital and religiosity may act as moderating influences. The regression results reported in **Table 3-16** show that neither social capital (Model 2) nor religion (Model 3) significantly modifies the relationship between regulatory fragmentation (Reg_Frag) and tax avoidance, as measured by CETR, given the small and statistically insignificant interaction coefficients. This suggests that, within our sample, the moderating influence of these cultural dimensions on the effect of fragmentation is limited once firm-level and contextual controls are considered.

Nonetheless, both models display negative and statistically significant coefficients for topic dispersion and regulation quantity, underscoring that the complexity and volume of regulation remain key determinants of tax behaviour irrespective of social or religious context. Taken together, although the empirical evidence does not confirm any moderating effect of social capital or religiosity, the theoretical and prior empirical literature indicates that these cultural factors remain pertinent to understanding the broader institutional environment in which

[12] We employ interpolative methods on ARDA datasets to develop local variables for the years when data are otherwise unavailable.

regulatory fragmentation operates. Their potential role as complementary mechanisms to formal regulatory enforcement warrants further investigation in future research—particularly across different legal systems and cultural contexts.

3.8 Conclusion

In In this paper, we analysed an extensive dataset comprising 32,348 firm-year observations of U.S.-listed firms from 1995 to 2019, derived from the Federal Register (FR). This dataset is instrumental in capturing the dynamics of regulatory action across multiple governmental agencies. By accounting for firm-specific characteristics, our analysis uncovered a robust negative correlation between regulatory fragmentation and tax avoidance practices. The study is grounded in the premise that the external regulatory environment exerts a profound influence on corporate decision-making and strategic behaviour. In particular, the concept of regulatory fragmentation—often associated with increased operational costs and reduced profitability and growth—was shown to also yield potential advantages, such as mitigating internal control deficiencies.

Our empirical findings demonstrate that regulatory fragmentation, characterised by the convergence of oversight from multiple regulatory bodies, is associated with lower levels of tax avoidance. Moreover, this study provides novel evidence on the moderating role of regulatory intensity in shaping this relationship. Specifically, the negative association between fragmentation and tax avoidance strengthens under conditions of high regulatory intensity, suggesting that frequent and active enforcement amplifies the deterrent effect of fragmented oversight by increasing both perceived detection risk and compliance pressure.

Beyond this moderating dynamic, our analysis further considers the influence of internal and external firm-specific factors—including innovation, managerial ability, financial constraint, profitability, CEO characteristics, local creative culture, social capital, and religion—on the relationship between regulatory fragmentation and tax avoidance. The results indicate that these factors interact in meaningful and complementary ways with regulatory conditions, offering a more comprehensive understanding of how institutional frameworks and firm-level characteristics jointly shape corporate tax behaviour.

To address potential endogeneity concerns, we employed Propensity Score Matching (PSM) and Two-Stage Least Squares (2SLS) regression techniques. The results from these robustness tests consistently reaffirm that regulatory fragmentation exerts a negative influence on tax avoidance.

From a theoretical perspective, these findings contribute to the literature by providing new evidence on how regulatory structure—specifically fragmentation—operates as an external monitoring mechanism that constrains managerial discretion and reduces opportunistic tax behaviour. Consistent with agency theory, the presence of multiple regulatory bodies enhances oversight, increases the likelihood of detection, and strengthens internal control environments, thereby limiting incentives for aggressive tax avoidance. In doing so, this study extends prior research on regulation and tax avoidance by demonstrating that not only the strength of regulation, but also its structure, plays a critical role in shaping corporate behaviour.

From a practical perspective, the findings carry important implications for regulators and policymakers. The results suggest that regulatory fragmentation, when accompanied by active enforcement, can serve as an effective deterrent to tax avoidance. For regulatory authorities, this highlights the importance of designing enforcement frameworks that leverage multiple oversight channels while ensuring coordination across agencies to avoid inefficiencies. Enhancing inter-agency communication and maintaining consistent enforcement intensity may improve monitoring effectiveness and reduce opportunities for regulatory arbitrage. Additionally, the findings suggest that policymakers should focus not only on increasing the quantity of regulation but also on improving its structure and enforcement mechanisms to achieve better compliance outcomes.

Despite its significant contributions, this study is not without limitations. Firstly, data availability constraints limit the extent to which the specific issues addressed by regulatory fragmentation can be directly linked to tax avoidance behaviour. Secondly, as the analysis is confined to U.S. firms, the generalisability of the findings may be restricted; variations in institutional structures across countries could yield differing outcomes. Lastly, although multiple control variables were included, other unobserved confounding factors may still influence the observed relationships.

Nevertheless, this study contributes to the expanding body of literature examining the regulatory environment's impact on corporate behaviour. By elucidating the relationship between regulatory fragmentation and tax avoidance, our findings advance the understanding of how regulatory structures shape managerial decision-making and corporate policy outcomes. Future research could extend this investigation to include cross-country analyses and explore additional mediating or moderating factors that may further clarify the mechanisms through which regulatory fragmentation influences firms' tax avoidance strategies.

Chapter 4

Technological Peer Pressure and Corporate Tax Avoidance

Chapter 4: Technological Peer Pressure and Corporate Tax Avoidance

Abstract

This study examines the relationship between technological peer pressure (TPP) and corporate tax avoidance (TA). Using a dataset of 18,985 firm-year observations from U.S.-listed firms in the period 1996–2019, we find that TPP significantly increases tax avoidance, suggesting that firms operating in competitive technological environments adopt more aggressive tax strategies to preserve resources and sustain innovation-driven competition. Further analysis reveals that financial constraint conditions this relationship: when firms face greater financial constraint, the positive association between TPP and tax avoidance becomes even stronger, indicating that constrained firms rely more heavily on tax savings as an internal financing mechanism. Our findings contribute to the literature on corporate taxation, peer effects, and competitive strategy by providing the first empirical evidence that technological peer pressure shapes tax planning behaviour and by showing that financial flexibility plays a critical role in determining heterogeneous firm responses to peer-driven competitive pressures.

Keywords: Tax avoidance, technological peer pressure, peer pressure, R&D, corporate tax avoidance

4.1 Introduction

In today's increasingly competitive and innovation-driven economy, firms are exposed not only to market pressures but also to evolving peer expectations, especially in industries characterised by rapid technological advancements. Technological peer pressure (TPP)—the pressure firms experience to emulate the innovation strategies and R&D intensity of their competitors—has emerged as a salient yet underexplored determinant of corporate strategic behaviour, including tax planning. This study aims to explore the extent to which TPP influences corporate tax avoidance, thereby contributing to the growing literature on the intersection of peer effects, innovation pressure, and fiscal behaviour. Peer pressure is a powerful force in shaping firms' strategic choices. TPP in particular becomes acute in R&D-intensive industries, where firms continuously monitor the innovation activities of rivals to avoid obsolescence (Cao et al., 2018, 2023). In such contexts, firms must strike a balance between preserving financial resources and maintaining innovation capacity—creating a tension that may spill over into decisions on tax strategy.

Theoretically, the effect of TPP on corporate tax avoidance is ambiguous. On the one hand, firms with high R&D expenditure and innovation commitments may avoid aggressive tax planning to preserve reputational capital, meet stakeholder expectations, and align with more conservative industry norms (Weber & Müßig, 2022). These firms are typically under heightened scrutiny from investors, regulators, and the media, which may incentivise transparency and tax compliance. The imperative to enhance productivity, reduce costs, and sustain long-term growth (Hart, 1983; Aghion et al., 1998; Aghion et al., 2005) may lead firms to prioritise regulatory compliance and financial transparency. Such strategic prioritisation inherently reduces the incentive for aggressive tax avoidance, as firms seek to uphold credibility and mitigate reputational risks. If market leaders within an industry engage in more conservative tax planning to maintain their reputational and regulatory standing, peer firms may feel compelled to follow suit, aligning their tax strategies with prevailing industry norms (Lieberman & Asaba, 2006). However, this strategic response is not uniform across firms.

On the other hand, engaging in tax avoidance may serve as a mechanism to preserve internal cash flows needed to fund expensive and risky innovation projects. According to Cao et al. (2023), research and development initiatives typically involve substantial long-term financial investments, which do not yield immediate returns, so may heighten their firm's vulnerability to financial pressure. The substantial costs and uncertainty may lead firms to face financial

constraints, so their responses to technological peer pressure may vary according to their financial condition. As a result, firms may strategically engage in tax avoidance as a mechanism to preserve internal cash flow and manage the financial burdens of innovation (Gao et al., 2016). Thus, the effect of technological peer pressure on corporate tax avoidance is shaped by firm-specific conditions: while some firms may reduce tax avoidance to signal transparency and align with industry expectations, others, particularly those facing tighter financial constraints, may intensify tax avoidance to ease liquidity pressures and sustain innovation investments.

This dynamic can be better understood through the lens of Institutional Theory, which emphasises how firms respond to coercive, mimetic, and normative pressures in their environments (DiMaggio & Powell, 1983). Under strong TPP, mimetic pressures dominate, as firms imitate their peers' strategies not only in innovation but also in complementary practices like tax planning that sustain innovation expenditure. Evidence from product market competition supports this view: Kubick et al. (2015) show that market leaders tend to engage in greater tax avoidance, and peers often mimic these strategies, normalising avoidance within industries. Similarly, Kim and Lee (2023) find that product market threats push firms towards higher tax avoidance, particularly when competitive pressures are intense. In this way, technological peer benchmarking could be seen to legitimise aggressive tax planning as an acceptable strategy for resource mobilisation, thereby reinforcing its adoption within competitive industries.

Resource Dependence Theory further reinforces this argument by highlighting that firms facing resource constraints will actively seek ways to secure and reallocate resources critical for survival and growth (Pfeffer & Salancik, 1978). Tax avoidance provides a direct means to provide the financial slack necessary to redirect towards technology adoption and R&D investment. This tendency is consistent with evidence that firms with stronger market power are more aggressive in tax avoidance to maintain their competitive advantage (Karamshahi et al., 2018). The pressure is particularly acute for firms with high financial constraints, where external financing is costly or limited. In such contexts, TPP not only encourages firms to innovate but also amplifies their reliance on aggressive tax strategies as a resource-saving mechanism. Thus, while TPP could theoretically encourage conformity to responsible tax behaviour, both institutional and resource-dependence perspectives suggest that the dominant outcome—especially under financial constraints—is an increase in corporate tax avoidance.

Recognising these divergent pathways, our study seeks to empirically assess whether and how technological peer pressure influences corporate tax avoidance, and whether this relationship is moderated by firm-level characteristics such as financial constraints. We adopt a firm-year-specific measure of TPP, following Cao et al. (2018), based on the R&D stock of peer firms operating in similar product markets. Tax avoidance is captured using the long-run CETR over five years, consistent with prior studies (Dyreng et al., 2008). Financial constraints are measured using the SA (size-age) index proposed by Hadlock and Pierce (2010), while R&D intensity is proxied through reported R&D expenditure scaled by total assets.

Our sample comprises 18,985 firm-year observations from publicly listed U.S. firms spanning the period from 1996 to 2019. Data on financial variables are retrieved from Compustat, and peer group structures are identified based on four-digit SIC code similarities and product segment overlaps. We apply a series of empirical models, including fixed effects regressions, Two-Stage Least Squares (2SLS) with instrumental variables, and Propensity Score Matching (PSM) to account for potential endogeneity and selection bias.

Our findings reveal a consistent and significant positive relationship between TPP and tax avoidance, suggesting that firms under greater technological pressure tend to adopt more aggressive tax strategies. This effect is more pronounced for firms facing severe financial constraints, which exhibit a positive interaction between TPP and tax avoidance, implying that limited access to external capital motivates these firms to exploit tax savings as an internal financing mechanism.

Taken together, these results contribute to the literature in several important ways. First, to the best of our knowledge, this is the first study to investigate and document the relationship between TPP and corporate tax avoidance. By extending the scope of peer effects research beyond innovation output towards fiscal behaviour, we demonstrate that peer-driven technological pressures spill over into tax planning decision-making. This novel perspective broadens our understanding of how competitive dynamics influence firms' strategic choices beyond their innovation activities. Second, we highlight the contingent role of firm-level characteristics—particularly financial constraint—in moderating this relationship, showing that the pressure to maintain technological competitiveness under resource limitations amplifies reliance on aggressive tax strategies. This insight integrates perspectives from Institutional Theory and Resource Dependence Theory, offering a richer explanation of why firms facing similar technological environments may diverge in their tax planning behaviour. Third, by

employing multiple measures of tax avoidance and rigorous robustness checks, we provide consistent empirical evidence that reinforces the validity and generalisability of our findings. Collectively, these contributions position our study at the intersection of the literatures on peer effects, innovation pressures, and corporate tax avoidance, therein opening new avenues for research on how competitive and institutional forces jointly shape firm behaviour.

The remainder of this paper is organised as follows: Section 2 provides the relevant literature review, establishing the theoretical foundation for our study. Section 3 outlines the research methodology, detailing the data collection process, sample selection criteria, and the analytical techniques employed. Section 4 presents the empirical results, offering interpretations of the key patterns and relationships observed in the analysis. Section 5 addresses potential concerns, incorporating robustness tests to enhance the credibility of our findings and the validity of our conclusions. Section 6 extends the analysis by exploring additional factors, offering deeper insights into the research questions while considering the effects of financial and regulatory environments on the identified relationships. Finally, Section 7 concludes the paper, summarizing the main findings, discussing implications, and suggesting directions for future research.

4.2 Literature / Hypotheses Development

4.2.1 Technological Peer Pressure

Peer influence plays a fundamental role in corporate decision-making, shaping key strategic choices such as production levels, financing decisions, executive compensation, and firm location. The market's reliance on peer-group-based stock valuation and performance benchmarking reinforces this dynamic, making firms highly responsive to industry norms and competitor behaviour (Arya & Mittendorf, 2005; Albuquerque, 2009; Reppenhagen, 2010; Tse & Tucker, 2010). Firms are not isolated decision-makers; instead, they operate in interconnected competitive environments where peer effects influence financial policies, disclosure practices, and operational strategies (Evans et al., 1992; John & Kadyrzhanova, 2008; Foucault & Fresard, 2014; Leary & Roberts, 2014).

Peer effects shape firms' investment strategies. Firms operating in highly competitive industries adjust their R&D expenditure, capital investments, and sustainability initiatives based on peer benchmarks. Wang et al. (2024) demonstrate that firms strategically align their investment behaviours with those of industry leaders to maintain market credibility and competitive

advantage. This pattern suggests that the peer-driven aspects of decision-making are not merely reactive but part of a deliberate strategy to optimise performance and navigate industry uncertainties.

One area where peer effects have been extensively documented is financial reporting and taxation. Firms frequently benchmark their tax strategies against industry peers, leading to convergent behaviours in tax planning and avoidance. For instance, Bird et al. (2018) and Armstrong et al. (2019) provide empirical evidence that firms adjust their corporate tax decisions based on the behaviour of their peers. Similarly, Li et al. (2014) highlight how firms use industry standards and competitor strategies as reference points in financial and operational decisions. The contagion effect in financial reporting further underscores the influence of peer behaviour on corporate transparency, where accounting restatements at one firm often lead investors to scrutinise and reassess the financial statements of peer firms, particularly those with high industry-adjusted accruals (Gleason et al., 2008).

As a subset of the broader concept of peer influence, technological peer pressure (TPP) has emerged as a key factor shaping corporate decision-making. Firms operating in highly competitive technological environments face increasing pressure to adapt their disclosure practices, investment strategies, and workforce planning in response to industry-wide innovation trends. TPP influences various aspects of corporate behaviour, from financial reporting and risk assessments to human capital management and sustainability strategies, highlighting its far-reaching impact. Given the increasing role of digital transformation and technological advances, understanding how TPP shapes corporate financial strategies, including tax planning and avoidance behaviours, is crucial.

TPP has emerged as a critical determinant of corporate decision-making, impacting fiscal reporting, sustainability commitments, auditor assessments, and workforce management. Firms operating in highly competitive technological environments face pressures to innovate, enhance transparency, and align their strategies with industry peers. Cao et al. (2018), having developed a firm-specific measure of TPP, demonstrate its role in shaping firms' disclosure practices to manage proprietary costs. Similarly, Wang et al. (2024) find that firms under strong technological competition tend to reduce their engagement in corporate social responsibility due to resource constraints and agency conflicts. In the auditing domain, Xu et al. (2022) show that auditors incorporate technological peer pressure into their risk assessments, leading to a higher likelihood of issuing going-concern opinions for financially distressed firms in highly

competitive technological environments. Furthermore, Cao et al. (2023) explore how TPP influences firms' human capital strategies, particularly in job postings where firms facing high TPP provide more specific skill requirements to attract tech talent. These studies collectively show that TPP shapes corporate decision-making in various domains, including disclosure, auditing, sustainability, and talent management—yet its role in financial behaviour, particularly tax avoidance, remains understudied.

4.2.2 Technological Peer Pressure and Corporate Tax Avoidance

While extensive literature links digital transformation and innovation to corporate tax behaviour, no studies directly explore the impact of TPP on tax avoidance. However, existing work offers clues. Empirical evidence suggests that corporate tax avoidance strategies are shaped by both internal firm-specific determinants and external peer influences. For example, Leary and Roberts (2014) emphasise that peer firms play a critical role in shaping corporate financial policies, including capital structure and financing decisions. Zhang and She (2024) further support this by demonstrating that corporate digital transformation curtails tax avoidance, specifically and primarily by reducing managerial agency costs and enhancing external scrutiny from media and financial analysts.

These findings align with prior research by Zhou et al. (2022) and Tiantian et al. (2023), which highlight the restraining effect of digital transformation on aggressive tax strategies, a relation in which the literature highlights the role of competitive benchmarking in tax strategies. This may be the case for firms investing heavily in innovation that face trade-offs between tax minimisation and long-term financial sustainability, according to research by Gkegkas (2020) on R&D investment and tax aggressiveness. In fact, Bird et al. (2018) and Armstrong et al. (2019) do find that firms tend to benchmark their tax strategies against industry peers, often converging in their avoidance behaviour.

The contagion effects in financial reporting (Gleason et al., 2008) and the impact of fraudulent disclosures on peer firm behaviour (Beatty et al., 2013) also suggest that peer dynamics can drive cautious behaviour to avoid reputational and regulatory risks. These insights imply that TPP may deter firms from engaging in aggressive tax avoidance as they seek legitimacy, transparency, and alignment with industry norms—especially when innovation-related pressures already strain financial and managerial resources.

Despite increasing recognition of peer effects in corporate decision-making, empirical research has not yet directly examined whether TPP curtails or facilitates corporate tax avoidance.

From one perspective, TPP may reduce tax avoidance. Firms facing intense technological competition often allocate substantial resources to innovation, digital transformation, and infrastructure (Cao et al., 2018, 2023). These capital-intensive investments create financial discipline, potentially precluding costly and complex tax planning strategies. Moreover, innovation-driven firms are subject to heightened scrutiny from analysts, institutional investors, and regulators (Bushee, 1998; Hall, 2002; Xu et al., 2022), which constrains managerial discretion and increases the risk of reputational costs from aggressive tax practices. Studies on digital transformation also document a disciplining effect on tax behaviour, showing that digital adoption curtails avoidance by increasing transparency and external monitoring (Zhou et al., 2022; Zhang & She, 2024). Taken together, these insights imply that under high TPP, firms may reduce tax avoidance to preserve legitimacy, signal reliability, and align with industry norms, particularly when innovation-related pressures already strain managerial and financial resources.

However, an alternative perspective—grounded in Institutional Theory and Resource Dependence Theory (RDT)—suggests that the dominant outcome of TPP is more likely an increase in tax avoidance. Institutional Theory posits that firms conform to coercive, mimetic, and normative pressures in their environment (DiMaggio & Powell, 1983). Under strong TPP, mimetic pressures may normalise not only innovation but also complementary practices such as tax avoidance, as firms imitate peers' strategies to secure resources and remain competitive. Empirical evidence from product market threats and competition supports this logic: Kim and Lee (2023) show that product market threats increase firms' tax avoidance, while Kubick et al. (2015) find that market leaders engage in higher avoidance and peers mimic these strategies. Similarly, Karamshahi and Salehi (2018) document that firms with stronger market power in emerging markets exhibit greater tax aggressiveness. These findings underscore how competitive pressures and peer benchmarking can legitimise avoidance as a rational response to resource-scarce business environments.

RDT complements this argument by emphasising that firms facing resource scarcity actively seek ways to secure and reallocate resources critical for survival and growth (Pfeffer & Salancik, 1978). Innovation-driven firms operating under TPP face substantial financing needs to sustain their target R&D needs and technological ambitions, often under conditions of

uncertain returns (Ok, 2025). In such cases, tax avoidance becomes an attractive mechanism for allowing internal financial slack, especially when access to external capital is limited; indeed, Zhang and She (2024) highlight that digital transformation can alter corporate tax strategies through resource reallocation. Meanwhile, Wu et al. (2023) show that peer effects in innovation intensify under such financing constraints, which may critically moderate the relationship between TPP and tax avoidance.

While unconstrained firms may limit avoidance to signal legitimacy, constrained firms under heavy tax pressure are more likely to aggressively exploit tax savings to preserve liquidity and sustain technological investment.

To the best of our knowledge, this is the first study to investigate the role of TPP in shaping firms' tax behaviour. We conceptualise TPP as a distinct form of competitive and institutional pressure that may alter managerial incentives and strategic resource allocations relevant to tax behaviour. Based on these theoretical foundations, we propose:

H1: There is a significant positive relationship between technological peer pressure and corporate tax avoidance.

4.2.3 Financial Constraint, TPP and Corporate Tax Avoidance

Building on the baseline argument that TPP encourages higher levels of tax avoidance (as developed in Hypothesis 1), we extend this logic by examining how financial constraints condition this relationship. Firms already under strong TPP must allocate significant resources to innovation and technological development. However, when these firms also face financing friction, the managerial calculus changes: tax avoidance shifts from being a discretionary strategy for competitive advantage into a necessary mechanism for survival and liquidity preservation.

Firms operating under intense technological competition are required to invest continuously in R&D, digital transformation, and innovation to maintain market relevance. These investments are capital-intensive, long-term, and often uncertain in payoff. When these innovation demands coincide with major financial constraints, the effect of TPP may increase, amplifying firms' financial vulnerabilities. Under such financial stress, companies may turn to aggressive tax planning as a means of preserving cash flows and maintaining operational flexibility (Desai & Dharmapala, 2009). Research shows that firms facing financial distress often resort to tax

minimisation to alleviate short-term liquidity pressures (Richardson et al., 2015; Alipour et al., 2025). Additionally, firms in capital-intensive industries, where technological innovation is costly, may view tax avoidance as a strategic tool to reallocate financial resources towards essential investments. In such cases, tax savings may allow firms to compensate for high R&D expenditure, workforce restructuring, and competitive price pressures (Dial & Murphy, 1995; Afcha & García-Quevedo, 2016).

Moreover, Institutional Theory suggests that firms tend to mimic the behaviours of successful industry leaders, particularly in highly competitive environments (DiMaggio & Powell, 1983). If industry-leading firms engage in aggressive tax planning to fund technological expansion, other firms may follow suit to avoid falling behind in the innovation race. Research has also shown that firms tend to align their tax strategies with those of industry leaders, particularly when peers engage in aggressive tax planning as a competitive strategy. Bird et al. (2018) provide evidence of this—that peer firms influence corporate tax behaviour—suggesting that firms may adopt similar tax minimisation approaches to remain aligned with industry norms.

Taken together, these arguments imply that while Hypothesis 1 predicts a positive relationship between TPP and tax avoidance, this relationship becomes stronger for firms with higher financial constraints. When capital is scarce, managers prioritise survival and flexibility, even at the expense of long-term reputational considerations. In such environments, tax avoidance becomes a vital strategic tool to preserve liquidity and sustain competitive positioning. Thus, under conditions of intense technological competition combined with financial distress, firms may have a stronger incentive to engage in tax avoidance as a means of maintaining market stability and competitive positioning. From these insights, we offer the following hypothesis:

H2: Financial constraints moderate the relationship between technological peer pressure and corporate tax avoidance.

4.3 Research Methodology

4.3.1 Sample

Our study investigates the relationship between technological peer pressure and corporate tax avoidance using U.S.-listed firms from 1996 to 2019. Financial and tax data are obtained from the Compustat database, which provides comprehensive firm-level financial statement information. The key independent variable, TPP, is measured using the firm-specific construct

developed by Cao et al. (2018), which captures the intensity of technological competition a firm faces in its product market. TPP is calculated based on a ratio of the R&D stock of technologically similar peer firms to the firm's own R&D stock, adjusted using cosine similarity in industry sales distribution across four-digit SIC codes. This measure reflects the relative technological preparedness of a firm vis-à-vis its competitors. The TPP data are sourced from the dataset made publicly available by Cao et al. and updated annually. Given the data availability, our analysis focuses on the 1996–2019 period, during which both financial and TPP variables are reliably observable. This unique variable enables us to capture nuanced, firm-level variation in technological competition, rather than relying on broader, less precise industry-level measures.

Table 4-1: Sample Selection

	Firm-Year Observations
TPP data available	79,156
After merging with COMPUSTAT data	63,456
(-) Missing value for dependent and control variable (final sample)	18,985

In line with prior research, we exclude firms operating in the regulated utility sector (SIC codes 4900–4999) and the financial industry (SIC codes 6000–6999). Observations missing values for the TPP variable are also removed. After applying these filters, the final sample used for the analysis of technological peer pressure, tax avoidance, and firm-level control variables consists of 18,985 firm-year observations (refer to **Table 4-1**).

4.3.2 Dependent Variable: Tax Avoidance

To capture firms' tax avoidance (TA) behaviour, we rely on the CETR, which is calculated as the ratio of cash taxes paid to pre-tax book income, adjusted for special items. This measure is widely adopted in prior research (Armstrong et al., 2012; Hasan et al., 2014; Kubick et al., 2015) because it reflects the actual tax payments made by firms, offering a clearer picture of their tax planning activities. Dyreng et al. (2008) emphasise CETR's reliability, as it incorporates the tax impact of employee stock options and is less affected by changes in accounting assumptions. Following the approach of Hasan et al. (2014), we ensure that all CETR values are bounded between 0 and 1, allowing for a meaningful interpretation—where

higher CETR values indicate less tax avoidance, and lower values reflect more aggressive tax strategies.

To reduce substantial fluctuations in annual tax avoidance estimates, we follow prior studies to calculate CETR over a five-year period (Dyreng et al., 2008; Chen et al., 2010; Hope et al., 2013; Lennox et al., 2013; Lisowsky et al., 2013). Specifically, CETR is measured by dividing the sum of cash taxes paid over the past five years by the sum of pre-tax book income minus special items over the same period. This approach captures both permanent and temporary book-tax differences. Consistent with previous literature (e.g., Dyreng et al., 2008; Hope et al., 2013), we truncate CETR values to the [0, 1] range and exclude observations where the five-year total pre-tax income, net of special items, is negative.

4.3.3 Independent Variable: Technological Peer Pressure

Technological peer pressure (TPP) is captured using a firm-level metric pioneered by Cao et al. (2018), designed to reflect the degree of technological competitive intensity within a firm's operational landscape. The metric evaluates how technologically advanced a firm's industry peers are in comparison to its own innovation activities. The construction of TPP begins with estimating the R&D capital (or R&D stock) of peer firms, which serves as a proxy for their technological capability. Peer similarity is determined using the overlap in product market activity, derived from the distribution of segment-level sales and aligned using four-digit SIC classifications. TPP is calculated as the ratio of the R&D stock of peer firms (weighted by their product market proximity) to the focal firm's R&D stock, with a logarithmic transformation applied to address scale and skewness. A higher TPP score indicates that a firm operates in an environment where technological advancement among peers exerts significant pressure, thereby influencing its strategic decisions. See Appendix for more detail.

4.3.4 Empirical Model

To test the first hypothesis (**H1**), we examine the relationship between technological peer pressure (TPP) and tax avoidance (CETR). The regression model is specified as follows:

H1: $\text{Tax Avoidance}_{i,t} = \beta 0 + \beta 1\ TPP_{i,t} + \beta 2\ MTB_{i,t} + \beta 3\ LEV_{i,t} + \beta 4\ FI_{i,t} + \beta 5\ PPE_{i,t} + \beta 6\ INTAN_{i,t} + \beta 7\ EQUITY_{i,t} + \beta 8\ ROA_{i,t} + + \beta 9\ CNOL_{i,t} + \beta 10\ NOL_{i,t} + \beta 11\ ACCRUALS_{i,t} + \beta 12\ MASCORE_{i,t} + \beta 13\ SIZE_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$

To investigate our second hypothesis (**H2**) we perform an empirical analysis measuring the effect of financial constraints on the relationship between TPP and CETR. The model is articulated as follows:

H2: Tax Avoidance $_{i,t} = \beta 0 + \beta 1\ TPP_{i,t+1} + Delaycon_{i,t} + Delaycon_{i,t} * TPP_{i,1+t} + Control\ variables_{i,t} + Year_{i,t} + Ind_{i,t} + \varepsilon_{i,t}$

where the dependent variable, tax avoidance, is proxied by the long-run five-year CETR for firm i and our primary independent variable, TPP, is constructed following the methodology of Cao et al. (2018). To control for other factors that may influence tax avoidance behaviour, we include a comprehensive set of firm-level characteristics. Prior research (e.g., Stickney & McGee, 1982; Zimmerman, 1983; Mills et al., 1998; Rego, 2003; Cheng, et al., 2010) suggests that tax avoidance is often linked to the complexity of business operations and economies of scale. Larger firms and those with more sophisticated structures may have greater access to resources and expertise to facilitate tax planning. Accordingly, our control variables include the market-to-book ratio (MTB), leverage (LEV), foreign income (FI), property, plant, and equipment (PPE), intangible assets (INTANG), equity method income (EQUITY), and R&D expenditure (RD). These variables help account for variation in business structure and scale and are generally hypothesized to be positively associated with tax avoidance behaviour.

We also include return on assets (ROA), net operating loss carryforwards (NOL), and changes in net operating loss (CNOL) as indicators of firms' incentives to reduce income tax obligations, consistent with Rego (2003) and Chen et al. (2010). In addition, we control for total accruals (ACCRUALS) due to the positive link between earnings management and tax avoidance, identified by Frank et al. (2009). Managerial ability is accounted for using the managerial ability score (MA_SCORE), developed by Demerjian et al. (2013), following evidence from (Koester et al., 2017), that more capable managers are more likely to adopt tax planning strategies. All models include year (t), and industry (i) fixed effects to adjust for unobserved heterogeneity over time and across sectors. Finally, financial constraints are included as a moderating variable to test the second hypothesis, measured using the "Delaying Capital Expenditure" indicator (Delaycon), which identifies firms that defer investment projects because of funding limitations (Hoberg & Maksimovic, 2015). Definitions of all variables are provided in the Appendix.

4.4 Analysis Results and Discussion

4.4.1 Summary Statistics and Correlations

Table 4-2 presents the descriptive statistics for the variables used in the analysis, providing insights into their distribution and variability. The dependent variable, CETR, has a mean of 0.199 and a standard deviation of 0.210, indicating meaningful variation in corporate tax avoidance practices among firms. TPP averages 6.05 with a maximum of 14.6, indicating that while some firms operate in highly competitive technological environments, others experience minimal peer-driven technological pressure.

Firm-specific financial characteristics also exhibit considerable spread. The market-to-book ratio (MTB) has a standard deviation of 5.44, reflecting significant heterogeneity in firm valuation and growth expectations. Leverage (LEV) ranges from 0 to 2.56, with a mean of 0.246, highlighting the variation in capital structure decisions. Net operating loss carryforwards (NOL) display wide variation, ranging from 0 to 34.3, indicating differences in firms' past financial performance and opportunities for tax deferral. Intangible assets (INTAN), property, plant, and equipment (PPE), and foreign income (FI) also show varying degrees of intensity, consistent with differences in industry composition.

Also as seen in **Table 4-2**, the return on assets (ROA) has a mean of 0.032, suggesting that firms in the sample, on average, exhibit modest profitability, though some are under financial pressure (the lowest at -1.93). Similarly, CNOL and ACCRUALS display ranges that include negative values, reflecting financial distress or earnings management practices. The MA_SCORE variable has a near-zero mean (0.007) with modest variation, while SIZE averages 5.33, ranging from -6.91 to 12.4, indicating the presence of both small and large firms in the sample.

Table 4-2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
CETR	18985	0.199	0.21	0.00	1.00
TPP	18985	6.052	3.05	0.00	14.6
MTB	18985	2.950	5.44	-18.3	33.9
LEV	18985	0.246	0.37	0.00	2.56
FI	18985	0.014	0.04	-.107	.179
PPE	18985	0.192	.171	.002	.838
INTAN	18985	0.203	.247	0.00	1.32
EQUITY	18985	0.000	.003	-.013	.023
RD	18985	0.078	.112	0.00	.675
ROA	18985	0.032	.308	-1.93	0.40

CNOL	18985	0.077	.443	-1.53	2.89
NOL	18985	1.351	4.48	0.00	34.3
ACCRUALS	18985	-0.091	0.20	-1.41	.318
MA	18985	0.007	0.12	-.196	.535
SIZE	18985	5.332	2.32	-6.91	12.4

Notes: This panel presents summary statistics for all the variables used in our analyses. All variables are defined in the Appendix.

Table 4-3 presents the correlation matrix of the key variables used in the regression analysis, providing insights into the linear relationships between corporate tax avoidance (CETR), technological peer pressure (TPP), and various firm-specific financial indicators. The correlation between TPP and CETR is negative and statistically significant (-0.103, $p < 0.01$), indicating that firms experiencing greater technological peer pressure tend to engage in more tax avoidance (lower CETR). This finding is consistent with the idea that firms operating in highly competitive technological environments may adopt aggressive tax-saving strategies to preserve financial flexibility and sustain innovation efforts.

The correlation matrix in **Table 4-3** also highlights significant associations among firm characteristics that underscore the need to control for confounding factors. Notably, firm size (SIZE) exhibits a strong negative correlation with TPP (-0.508, $p < 0.01$) and a positive correlation with CETR (0.182, $p < 0.01$). This suggests that larger firms face less technological peer pressure while simultaneously engaging in lower levels of tax avoidance (higher CETR). The dual influence of SIZE on both TPP and CETR underscores its importance as a control variable, and failing to account for firm size could bias estimates of the direct effect of technological peer pressure on tax avoidance.

Additionally, in **Table 4-3**, several financial characteristics show significant correlations with CETR. Leverage (LEV) is negatively correlated with CETR (-0.119, $p < 0.01$), indicating that more highly leveraged firms tend to engage in greater tax avoidance, possibly to manage debt-related obligations. Return on assets (ROA) is positively correlated with CETR (0.270, $p < 0.01$), suggesting that more profitable firms are less aggressive in tax avoidance, potentially due to heightened scrutiny or stronger incentives for regulatory compliance. Both net operating loss carryforwards (NOL) and current net operating losses (CNOL) are negatively correlated with CETR (-0.249 and -0.136, respectively; $p < 0.01$), highlighting that firms with accumulated losses have stronger incentives to reduce taxable income, using carryforwards as part of their tax planning toolkit. Both net operating loss carryforwards (NOL) and current net operating losses (CNOL) are negatively correlated with CETR (-0.249 and -0.136, respectively; $p < 0.01$),

highlighting that firms with accumulated losses have stronger incentives to reduce taxable income, using carryforwards as part of their tax planning toolkit.

While the correlation analysis provides a useful initial view of the relationships among key variables, it remains a descriptive step that does not account for the complexities of multivariate interactions. Correlations capture only bivariate associations, without isolating the unique contribution of each factor when other determinants are considered. Thus, although these results suggest that technological peer pressure and firm-specific financial indicators are significantly related to tax avoidance, the regression analysis is essential for evaluating the robustness of these patterns once controls and fixed effects are incorporated. A further consideration is that observed correlations may reflect unobserved firm-specific and industry-level characteristics that simultaneously influence both technological peer pressure and tax strategies. Firms' tax planning behaviours are not shaped in isolation but by a broader context of competitive pressures, regulatory environments, and governance structures—factors that simple correlations cannot disentangle. Nonlinear effects or interaction terms may also play a role, such that the strength or direction of the TPP-CETR relationship could vary with firms' financial constraints.

Table 4-3: Pairwise Correlations

Variables	1	2	3	4	5	6	7	8
(1) CETR	1.000							
(2) TPP	-0.103***	1.000						
(3) MTB	-0.033***	-0.038***	1.000					
(4) LEV	-0.119***	0.025***	-0.076***	1.000				
(5) FI	0.069***	-0.193***	0.078***	-0.023***	1.000			
(6) PPE	0.056***	-0.084***	-0.016**	0.180***	0.037***	1.000		
(7) INTAN	0.006	-0.081***	0.042***	0.242***	0.067***	-0.154***	1.000	
(8) EQUITY	0.047***	-0.109***	0.025***	0.018**	0.067***	0.098***	-0.007	1.000
(9) RD	-0.244***	0.070***	0.029***	0.006	-0.100***	-0.256***	-0.139***	-0.089***
(10) ROA	0.270***	-0.197***	0.066***	-0.290***	0.218***	0.161***	0.102***	0.065***
(11) CNOL	-0.136***	0.084***	0.001	0.215***	-0.080***	-0.031***	0.015**	-0.017**
(12) NOL	-0.249***	0.185***	-0.043***	0.451***	-0.103***	-0.081***	-0.048***	-0.036***
(13) ACCRUALS	0.176***	-0.123***	0.037***	-0.341***	0.133***	0.000	-0.032***	0.052***
(14) MA_SCORE	-0.041***	0.084***	0.098***	-0.031***	0.117***	-0.173***	-0.050***	-0.021***
(15) SIZE	0.182***	-0.508***	0.082***	-0.102***	0.305***	0.144***	0.255***	0.132***

Variables	9	10	11	12	13	14	15
(9) RD	1.000						
(10) ROA	-0.467***	1.000					
(11) CNOL	0.229***	-0.473***	1.000				
(12) NOL	0.366***	-0.636***	0.407***	1.000			
(13) ACCRUALS	-0.245***	0.567***	-0.366***	-0.489***	1.000		
(14) MA	0.211***	0.082***	-0.037***	0.074***	0.015**	1.000	
(15) SIZE	-0.283***	0.439***	-0.207***	-0.455***	0.261***	-0.051***	1.000

Notes: This table reports Pearson correlations among the main variables used in our analyses. All variables are defined in the Appendix. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Finally, the correlation results alone cannot resolve issues of directionality or causality. While the negative and significant association between TPP and CETR suggests that firms under stronger technological peer pressure are more likely to engage in tax avoidance, it remains unclear whether peer pressure actively drives this behaviour, or whether firms in industries with greater technological competition already pursue more aggressive tax strategies. The regression analysis therefore serves to clarify whether these associations reflect substantive economic effects or spurious correlations, providing a more nuanced understanding of how technological peer pressure shapes corporate tax behaviour.

4.4.2 Regression Result and Discussion

Table 4-4 presents the regression results examining the association between technological peer pressure and corporate tax avoidance, as measured by CETR. Across both models, the coefficient on TPP is negative and statistically significant (-0.005 and -0.004, $p < 0.01$), indicating that firms exposed to higher levels of technological competition from their industry peers tend to engage in greater tax avoidance. In other words, increased technological peer pressure is associated with a lower CETR, consistent with the argument that firms operating in highly competitive technological environments adopt aggressive tax-saving strategies to preserve financial flexibility and sustain innovation-driven rivalry. This finding aligns with institutional perspectives suggesting that firms under strong peer influence may normalize tax avoidance as a strategic response to competitive pressure (DiMaggio & Powell, 1983; Kim & Lee, 2023).

From a resource dependence perspective, this behaviour can also be interpreted as a response to heightened financing pressure associated with continuous innovation investment. Firms facing intense technological competition are often required to allocate substantial resources to R&D activities, which may increase reliance on internal financing channels. In this context, tax avoidance serves as a liquidity-preserving mechanism that allows firms to reallocate resources toward innovation and maintain competitive positioning (Pfeffer & Salancik, 1978; Desai & Dharmapala, 2009). Moreover, peer rivalry may further expand managerial discretion, as firms justify aggressive tax strategies by benchmarking against competitors' behaviour, thereby reinforcing mimetic responses within innovation-intensive industries (Cao et al., 2018; Cao et al., 2023).

Looking at the control variables in Table 4, several results are noteworthy. The negative and significant coefficients for MTB, LEV, PPE, NOL, ACCRUALS, and MA_SCORE suggest

that firms with higher growth opportunities, greater leverage, larger tangible assets, accumulated loss carryforwards, or stronger managerial ability are more likely to engage in tax minimisation, consistent with prior evidence on the incentives and capacity of such firms to exploit tax planning opportunities (Hanlon & Heitzman, 2010; McGuire et al., 2012). Conversely, the positive coefficients for ROA and SIZE indicate that more profitable and larger firms tend to exhibit higher CETR, suggesting reduced tax avoidance, likely due to heightened scrutiny from regulators, analysts, and the public (Bushee, 1998; Edwards et al., 2016).

Taken together, these results demonstrate that TPP exerts a strong facilitating effect on corporate tax avoidance, reinforcing the notion that peer dynamics in innovation-intensive industries create both competitive and financial pressures that encourage firms to adopt tax avoidance as a strategic tool. This interpretation is consistent with prior research showing that peer effects influence corporate decision-making beyond innovation activities and extend to broader strategic behaviours, including financial and tax-related decisions (Cao et al., 2018; Cao et al., 2023). However, this baseline relationship may not be uniform across firms. In the following section, we investigate whether financial constraint moderates the association between TPP and tax avoidance, as constrained firms may be even more inclined to rely on tax savings as an internal financing mechanism to sustain technological investment and operational continuity (Desai & Dharmapala, 2009; Richardson et al., 2015).

Table 4-4: The Relation Between TPP and Tax Avoidance

	(1) CETR	(2) CETR
TPP	-0.005***	-0.004***
	(-10.65)	(-7.83)
MTB	-	-0.002***
		(-6.69)
LEV	-	-0.024***
		(-5.80)
FI	-	0.058
		(1.57)
PPE	-	-0.059***
		(-5.78)
INTAN	-	-0.008
		(-1.33)
EQUITY	-	0.790**
		(1.97)
RD	-	-0.233***
		(-17.05)
ROA	-	0.081***
		(13.93)
CNOL	-	0.002
		(0.71)
NOL	-	-0.002***
		(-4.94)

ACCRUALS	-	-0.001
		(-0.06)
MA	-	-0.033***
		(-2.90)
SIZE	-	0.021***
		(11.18)
CONSTANT	0.230***	0.258***
	(71.90)	(53.17)
N	18985	18985
R^2	0.062	0.143
Clustering	By firm and year	By firm and year
adj. R^2	0.058	0.139

Notes: This table displays the results of an OLS regression estimating the impact of technological peer pressure (TPP) on tax avoidance, measured by the cash effective tax rate (CETR). Standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

In addition to statistical significance, the economic magnitude of the estimated effects further highlights the practical relevance of the findings. The coefficient on technological peer pressure (TPP) is -0.005 in Model (1) and -0.004 in Model (2), indicating that a one-unit increase in TPP is associated with a reduction in CETR of approximately 0.4 to 0.5 percentage points. However, a one-unit change represents a relatively small shift in technological peer pressure.

To provide a more economically meaningful interpretation, we consider a one standard deviation increase in TPP. Based on the sample distribution, such a change corresponds to a reduction in CETR of approximately 1.53% in Model (1) and 1.22% in Model (2). Given that CETR is bounded between zero and one and tends to vary within a relatively narrow range across firms, these effects are economically meaningful. Consequently, even moderate increases in technological peer pressure can lead to non-trivial reductions in firms' effective tax rates, reflecting more aggressive tax avoidance behaviour. This suggests that firms operating in more competitive and innovation-intensive environments may systematically rely on tax avoidance as a mechanism to preserve financial resources. Overall, these results indicate that the impact of technological peer pressure is not only statistically significant but also economically meaningful, with tangible implications for firms' tax planning strategies and financial positioning.

Table 4-5 presents the regression results evaluating how financial constraints moderate the influence of TPP on corporate tax avoidance as measured by CETR. Financial constraints are captured using the "Delaying Capital Expenditure" indicator (Delaycon), which identifies firms that postpone investments due to financial difficulties (Hoberg & Maksimovic, 2015).

The interaction term between TPP and Delaycon is negative and statistically significant (-0.036, p < 0.01 in Model 1; -0.023, p < 0.01 in Model 2), indicating that financially constrained firms are more likely to intensify tax avoidance when exposed to technological peer pressure. In other

words, while TPP on its own already promotes greater tax avoidance (negative coefficients on TPP), this effect becomes stronger for firms facing tighter financial conditions, as they increasingly rely on tax savings to preserve liquidity and operational flexibility.

Table 4-5: The Moderating Effect of Financial Constraint (H2)

	(1) CETR	(2) CETR
TPP	-0.006***	-0.005***
	(-9.28)	(-6.41)
Delaycon	-0.052	-0.031
	(-1.07)	(-0.66)
TPP * Delaycon	-0.036***	-0.023***
	(-5.05)	(-3.32)
MTB	-	-0.002***
		(-5.22)
LEV	-	-0.023***
		(-3.89)
FI	-	0.044
		(0.88)
PPE	-	-0.055***
		(-4.10)
INTAN	-	-0.012
		(-1.47)
EQUITY	-	1.427***
		(2.87)
RD	-	-0.224***
		(-12.13)
ROA	-	0.089***
		(10.71)
CNOL	-	0.004
		(0.97)
NOL	-	-0.003***
		(-5.13)
ACCRUALS	-	-0.003
		(-0.22)
MA	-	-0.008
		(-0.55)
SIZE	-	0.017***
		(6.67)
CONSTANT	0.235***	0.262***
	(52.63)	(39.95)
N	11889	11889
R^2	0.063	0.133
Clustering	By firm and year	By firm and year
adj. R^2	0.058	0.127

Notes: This table presents regression results examining the moderating effect of financial constraints (Delaycon) on the relation between technological peer pressure (TPP) and tax avoidance (CETR) (Hypothesis 2) in Columns (1) and (2). All variables are defined in Appendix. Standard errors are reported in parentheses and clustered by firm and year. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

This result can be interpreted through the lens of resource dependence theory, where financially constrained firms face greater pressure to secure internal sources of funding. Under such conditions, tax avoidance becomes a critical tool for alleviating financing constraints and

sustaining investment in innovation. At the same time, heightened peer pressure may further legitimise such behaviour, as firms observe and emulate the fiscal strategies of their competitors in similar financial positions. This interaction highlights how external competitive pressures and internal resource limitations jointly shape corporate tax behaviour.

Overall, these results confirm that the impact of technological peer pressure is not uniform across firms but is conditioned by their financial health. Unconstrained firms may still manage to balance peer influence with compliance pressures, but constrained firms shift toward aggressive tax minimisation as one of the few available levers to buffer resource shortages. This finding is consistent with prior evidence that financial stress amplifies reliance on short-term tax strategies (Desai & Dharmapala, 2009; Richardson et al., 2015) and further supports the view that tax avoidance serves as a strategic response to both competitive and financial pressures in innovation-driven environments.

4.5 Endogeneity Tests

In this section, we address potential endogeneity concerns that could bias the estimated relationship between TPP and corporate tax avoidance. A primary source of endogeneity is omitted variable bias, which may arise when unobserved factors simultaneously affect both TPP and tax avoidance. While we mitigate this issue by incorporating a comprehensive set of firm-level control variables, including proxies for firm complexity, profitability, and managerial ability, the risk of unmeasured confounders remains. To strengthen the credibility of our findings and isolate the causal impact of TPP, we employ a Two-Stage Least Squares (2SLS) instrumental variable (IV) approach. Specifically, we construct an external instrument based on the industry-state average of technological peer pressure (State AVR/ Peer_TPP) to predict firm-level TPP. The results from the second-stage regression confirm our earlier findings, showing a significant and negative relationship between TPP and CETR, consistent with the hypothesis that firms under greater technological peer pressure engage in higher levels of tax avoidance. In addition, we conduct robustness checks using Propensity Score Matching (PSM) to account for observable selection bias, further validating our results.

4.5.1 Two-Stage Least Square

To re-evaluate the relationship between TPP and corporate tax avoidance while addressing concerns of endogeneity, we apply a Two-Stage Least Squares (2SLS) regression using an instrumental variable (IV) approach. This method mitigates potential biases arising from

unobserved firm characteristics, correlated innovation environments, and industry-level shocks that may simultaneously influence both TPP and firms' tax behaviour.

Consistent with prior literature, we use the average technological peer pressure of firms within the same industry (Peer_TPP) as the instrumental variable. This measure captures exogenous variation in the technological intensity of peer firms, which shapes the focal firm's exposure to peer pressure but is unlikely to directly affect its individual tax avoidance decisions. The identification assumption relies on the idea that peer firms' technological intensity affects a firm's tax behaviour only through its impact on the firm's own technological peer pressure (TPP), thereby satisfying the exclusion restriction. Similar approaches have been employed by Desai and Dharmapala (2009), Cai and Liu (2009) and Dyreng et al. (2025), who utilise industry-level peer measures to address endogeneity in corporate behaviour settings.

Table 4-6: Two-Stage Least Squares (2SLS)

	(1) **Dependent variable** **TPP**	**(2)** **Dependent variable** **CETR**
Peer_TPP	0.117***	-
	(5.56)	
TPP (TPP = Peer_TPP)	-	-0.041***
		(-2.86)
MTB	-0.017***	-0.002***
	(-4.63)	(-6.21)
LEV	-0.253***	-0.033***
	(-3.86)	(-5.51)
FI	-15.801***	-0.531**
	(-30.83)	(-2.29)
PPE	-0.513***	-0.077***
	(-3.62)	(-5.52)
INTAN	-1.604***	-0.067***
	(-17.53)	(-2.84)
EQUITY	-71.824***	-1.890*
	(-12.73)	(-1.66)
	-3.607***	-0.368***
	(-16.59)	(-6.76)
ROA	-1.680***	0.018
	(-16.52)	(0.71)
CNOL	-0.085*	-0.001
	(-1.70)	(-0.25)
NOL	0.147***	0.004*
	(22.88)	(1.70)
ACCRUALS	0.162	0.006
	(1.32)	(0.65)
MA	1.563***	0.029
	(8.69)	(1.09)
SIZE	1.047***	0.060***
	(41.01)	(3.99)
CONSTANT	2.040***	0.465***
	(5.00)	(9.00)

N	18936	18814
R^2		-0.066
adj. R^2		-0.071

Notes: This table reports the first and second stage of the IV regression, where Peer_Credit is used as an instrument for TPP. Column (1) presents the first-stage regression of TPP on Peer_TPP. Column (2) presents the second-stage regression of CETR on the fitted values of TPP. *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the first stage, the instrument performs strongly, with Peer_TPP exhibiting a positive and highly significant coefficient (0.117, t = 5.56), confirming its relevance in predicting TPP. In the second stage, the coefficient on TPP is negative and statistically significant (−0.041, t = −2.86), indicating that greater technological peer pressure causally increases corporate tax avoidance (i.e., lowers CETR). These findings provide robust evidence that the baseline relationship is not driven by endogeneity concerns.

To further assess the validity of the instrumental variable approach, we report a set of standard diagnostic tests. First, the Anderson canonical correlation LM statistic for identification is highly significant (Chi-sq.= 31.05, p < 0.001), rejecting the null hypothesis of under identification and confirming that the instrument is sufficiently correlated with the endogenous variable. Second, the strength of the instrument is evaluated using the Cragg–Donald Wald F statistic, which is 30.95 and exceeds the Stock–Yogo critical values (e.g., 16.38 at the 10% maximal IV size), indicating that the instrument is not weak.

Finally, the Sargan statistic is equal to zero, reflecting that the model is exactly identified, and therefore the overidentification test is not applicable in this setting. Overall, these diagnostic results provide strong and consistent support for the validity and strength of the instrument, reinforcing the credibility of the causal interpretation of the 2SLS estimates. These findings reinforce the argument that technological peer dynamics exert a causal influence on firms' tax strategies. By leveraging exogenous variation in peer technological intensity, our analysis strengthens confidence in the conclusion that TPP pushes firms toward greater reliance on tax avoidance as a strategic response to competitive technological environments.

4.5.2 Propensity Score Matching Test

In this section, we apply the Propensity Score Matching (PSM) technique to mitigate potential biases arising from systematic differences between firms exposed to different levels of technological peer pressure. Following the approach of Shipman et al. (2017), the PSM framework helps account for observable firm characteristics that may not be fully controlled in traditional regression models. Firms are classified into treatment and control groups based on a median split of technological peer pressure (TPP).

Firms with above-median TPP are assigned to the treatment group (high TPP), while those below the median are assigned to the control group (low TPP). The propensity scores are estimated using a probit model, where the dependent variable is an indicator for high TPP exposure. The model includes firm-level characteristics consistent with the baseline specification, including MTB, LEV, FI, PPE, INTAN, EQUITY, RD, ROA, CNOL, NOL, ACCRUALS, MA_SCORE, and SIZE, in addition to year and industry fixed effects. The matching procedure is implemented using one-to-one nearest-neighbour matching with replacement and a calliper width of 0.001 to ensure precise matches between treated and control firms.

Table 4-7 presents the regression results based on the matched sample. Column (1) reports the probit model estimating the likelihood of a firm being exposed to high TPP. Columns (2) and (3) present the effect of TPP on CETR in the matched sample, while Column (4) further incorporates the interaction between TPP and financial constraint (Delaycon). Across specifications, the coefficient on TPP remains negative and statistically significant, confirming that firms exposed to stronger technological peer pressure engage in greater tax avoidance, as reflected in lower CETR. The negative and significant coefficient on the interaction term between TPP and Delaycon further indicates that financially constrained firms intensify their reliance on tax avoidance under technological peer pressure, consistent with the second hypothesis. Overall, the matched-sample results reinforce the validity of the baseline findings and strengthen the causal interpretation of the relationship between TPP and corporate tax avoidance.

Table 4-7: Propensity Score Matching PSM

	(1) High TPP	(2) CETR	(3) CETR	(4) CETR
TPP	-	-0.005***	-0.004***	-0.005***
		(-4.55)	(-3.91)	(-3.00)
Delaycon	-	-	-	0.005
				(0.04)
TPP * Delaycon	-	-	-	-0.031*
				(-1.79)
MTB	-0.005***		-0.002***	-0.002**
	(-2.62)	-	(-3.19)	(-2.58)
LEV	-0.214***		-0.031***	-0.028**
	(-5.22)	-	(-3.22)	(-2.06)
FI	-7.108***		0.050	0.028
	(-22.65)	-	(0.64)	(0.26)
PPE	-0.265***		-0.070***	-0.068**
	(-3.54)	-	(-3.37)	(-2.45)
INTAN	-0.611***		-0.021*	-0.017
	(-12.13)	-	(-1.67)	(-0.95)
EQUITY	-20.751***		0.944	2.605**

	(-6.85)	-	(0.95)	(2.05)
RD	-0.817***		-0.248***	-0.223***
	(-6.35)	-	(-7.04)	(-4.91)
ROA	-0.670***		0.085***	0.103***
	(-10.26)	-	(4.61)	(4.31)
CNOL	-0.014		0.003	0.001
	(-0.42)	-	(0.31)	(0.09)
NOL	0.052***		-0.005***	-0.007***
	(10.40)	-	(-3.13)	(-3.02)
ACCRUALS	0.229***		-0.036	-0.049
	(2.99)	-	(-1.58)	(-1.64)
MA	0.619***		-0.011	0.041
	(6.39)	-	(-0.41)	(1.11)
SIZE	0.228***		0.017***	0.011*
	(16.90)	-	(3.94)	(1.93)
CONSTANT	-1.126***	0.240***	0.276***	0.276***
	(-4.73)	(33.14)	(26.53)	(18.94)
N	18950	4036	4036	2487
R^2	-	0.071	0.140	0.145
adj. R^2	-	0.056	0.123	0.120

Notes: This table reports Propensity Score Matching (PSM) results assessing the effect of technological peer pressure (TPP) on tax avoidance (CETR). Column (1) presents the probit model predicting high TPP exposure based on firm characteristics. Columns (2) and (3) show the effect of TPP on CETR in matched samples, while Column (4) includes the moderating role of financial constraints (Delaycon).

To further assess the quality of the matching procedure, we report standard covariate balance diagnostics before and after matching (**Table 4-8**). The results indicate that, prior to matching, treated and control firms exhibit notable differences across several covariates. However, after matching, these differences are substantially reduced. In particular, the mean standardised bias decreases from 19.8% to 4.1%, and the median bias from 17.5% to 3.0%, indicating a significant improvement in covariate balance.

Furthermore, covariates exhibit standardised differences well below the conventional threshold of 10% after matching, suggesting that the matching procedure effectively balances observable characteristics between treated and control firms. Consistent with this, Rubin's B statistic decreases from 71.8 to 12.9, and Rubin's R statistic falls within the acceptable range, further confirming the quality of the matching process.

Table 4-8: Covariate Balance Before and After Matching

Variable	Treated (Before)	Control (Before)	Bias (%) Before	Treated (After)	Control (After)	Bias (%) After
MTB	2.8565	3.0488	-3.5	2.8811	2.8488	0.6
LEV	0.2381	0.2528	-4.0	0.2341	0.2312	0.8
FI	0.0057	0.0224	-43.0	0.0062	0.0070	-2.3
PPE	0.1727	0.2111	-22.5	0.1732	0.1748	-0.9
INTAN	0.1814	0.2245	-17.5	0.1829	0.1894	-2.6
EQUITY	0.0001	0.0007	-17.2	0.0001	0.0000	3.0
ROA	-0.0250	0.0889	-37.6	-0.0157	0.0110	-8.8

Variable	Treated (Before)	Control (Before)	Bias (%) Before	Treated (After)	Control (After)	Bias (%) After
RD	0.0925	0.0642	25.3	0.0910	0.0881	2.6
CNOL	0.1127	0.0412	16.2	0.1076	0.0833	5.5
NOL	2.0657	0.6370	32.3	1.9025	1.4794	9.6
ACCRUALS	-0.1103	-0.0717	-19.4	-0.1076	-0.1016	-3.1
MA_SCORE	0.0172	-0.0029	16.9	0.0169	0.0265	-8.1
SIZE	0.2520	0.2658	-1.5	0.2628	0.3197	-6.0

Notes: This table reports covariate balance before and after propensity score matching. Bias (%) represents the standardised mean difference between treated and control firms. The results indicate a substantial reduction in covariate imbalance after matching. In particular, the mean bias declines from 19.8% to 4.1%, while Rubin's B decreases from 71.8 to 12.9 and Rubin's R remains within the acceptable range, confirming a high degree of balance in the matched sample.

In addition, the common support condition is satisfied, as sufficient overlap is observed in the distribution of propensity scores between treated and control firms. This indicates that the matching procedure is not driven by extrapolation and supports the validity of the PSM design. These results indicate that the matching procedure successfully achieves a high degree of covariate balance, enhancing the credibility of the estimated treatment effects.

4.6 Additional Robustness Analysis

4.6.1 Different Measure of Tax Avoidance (ETR)

To validate the robustness of our primary findings, we re-estimate our models using an alternative measure of tax avoidance—the long-run five-year Effective Tax Rate (ETR). This measure is calculated by dividing the sum of cash taxes paid over five years by the sum of pre-tax income minus special items over the same period, thereby smoothing year-to-year fluctuations and capturing more persistent tax behaviour (Dyreng et al., 2008). **Table 4-9** presents the results of this robustness check. Column (1) confirms the baseline relationship: TPP is negatively and significantly associated with ETR ($\beta = 0.002$, $p < 0.01$), supporting our initial hypothesis that firms operating under greater technological peer pressure tend to exhibit higher levels of tax avoidance.

Table 4-9: ETR as Alternative Measure of Tax Avoidance

	(1) ETR	(2) ETR	(3) ETR
TPP	-0.006***	-0.004***	-0.006***
	(-12.29)	(-8.28)	(-7.83)
Delaycon	-	-	-0.070
			(-1.45)
TPP * Delaycon	-	-	-0.011*
			(-1.65)
MTB	-	-0.001***	-0.001**
		(-3.58)	(-2.44)
LEV	-	-0.021***	-0.015**

		(-4.59)	(-2.32)
FI	-	0.024	0.037
		(0.58)	(0.67)
PPE	-	0.003	0.003
		(0.29)	(0.25)
INTAN	-	-0.009	-0.012
		(-1.27)	(-1.24)
EQUITY	-	1.797***	1.867***
		(3.71)	(3.28)
RD	-	-0.222***	-0.220***
		(-14.67)	(-10.87)
ROA	-	0.092***	0.099***
		(14.75)	(11.15)
CNOL	-	0.001	0.003
		(0.23)	(0.55)
NOL	-	-0.002***	-0.003***
		(-5.67)	(-5.05)
ACCRUALS	-	-0.001	-0.008
		(-0.10)	(-0.60)
MA	-	0.017	0.021
		(1.38)	(1.23)
SIZE	-	0.019***	0.020***
		(9.56)	(7.45)
CONSTANT	0.258***	0.268***	0.277***
	(78.77)	(52.42)	(40.53)
N	18983	18983	11889
R^2	0.050	0.132	0.126
adj. R^2	0.046	0.128	0.120

Notes: This table repeats the main analysis using ETR (book effective tax rate) as an alternative measure of tax avoidance. Columns test for consistency in baseline and moderated relationships using Delaycon. *t* statistics are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In **Table 4-9**, Column (3), we assess how this relationship is moderated by financial constraints. Column (3) shows that the interaction term TPP × Delaycon is negative and statistically significant ($\beta = -0.003$, $p < 0.01$), consistent with our second hypothesis. This suggests that financially constrained firms are more likely to engage in tax avoidance when facing TPP, possibly as a liquidity-preserving mechanism (Desai & Dharmapala, 2009). Overall, these findings reaffirm that the relationship between technological peer pressure and tax avoidance is not only statistically significant but also robust across different tax avoidance measures.

4.6.2 Different Measures of Financial Constraint

As a robustness check for our third hypothesis, we re-estimate the model using two alternative measures of financial constraint: the "Equity over Total Debt" ratio (EQ_Debt) and the "Delaying Capital Expenditure" indicator (Delaycon dummy). These proxies capture liquidity-driven constraints and leverage-related financing pressure, respectively. Delaycon identifies firms that postpone investment due to financial difficulties, following Hoberg & Maksimovic (2015), while EQ_Debt reflects the reliance on internal versus external financing, following the

approach of Linn & Weagley (2023) and widely used in the financial constraint literature.

In both specifications shown in **Table 4-10**, the interaction terms between TPP and both financial constraint measures remain negative and statistically significant (TPP × EQ_Debt = -0.007, $p < 0.01$; TPP × Delaycon dummy = -0.002, $p < 0.05$). These results replicate our main findings, reinforcing the notion that firms under tighter financial constraints are more likely to engage in tax avoidance when facing technological peer pressure. Specifically, firms with limited liquidity or higher debt dependency appear to prioritise immediate financial flexibility over reputational concerns, thus weakening the disciplining effect of TPP. This evidence provides further empirical support for H2, affirming that the influence of technological peer pressure on tax behaviour is contingent on a firm's financial capacity to absorb strategic risks.

Table 4-10: Alternative Measure of Financial Constraints

	(1) **CETR**	**(2)** **CETR**
TPP	-0.005***	-0.003***
	(-9.20)	(-3.08)
EQ_ Debt	0.010	-
	(1.17)	
TPP * EQ_ Debt	-0.007***	-
	(-5.47)	
Delaycon (dummy)	-	-0.001
		(-0.13)
TPP * Delaycon (dummy)	-	-0.002**
		(-2.38)
MTB	-0.001***	-0.002***
	(-5.42)	(-6.67)
LEV	-0.018***	-0.024***
	(-4.29)	(-5.87)
FI	0.042	0.058
	(1.08)	(1.56)
PPE	-0.059***	-0.059***
	(-5.65)	(-5.73)
INTAN	-0.006	-0.009
	(-0.98)	(-1.43)
EQUITY	0.646	0.773*
	(1.59)	(1.93)
RD	-0.231***	-0.231***
	(-16.70)	(-16.93)
ROA	0.077***	0.080***
	(12.96)	(13.63)
CNOL	0.003	0.002
	(1.00)	(0.66)
NOL	-0.002***	-0.002***
	(-5.03)	(-4.80)
ACCRUALS	-0.003	-0.001
	(-0.36)	(-0.15)
MA	-0.038***	-0.032***
	(-3.23)	(-2.78)
SIZE	0.023***	0.021***

	(12.09)	(11.36)
CONSTANT	0.259***	0.259***
	(50.73)	(39.20)
N	17858	18985
R^2	0.148	0.144
adj. R^2	0.144	0.140

Notes: This table uses two alternative proxies for financial constraint: Delaycon (investment delay due to constraints) and EQ_Debt (equity-to-debt ratio). The interaction terms test their moderating effect on the TPP–CETR relationship. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.7 Further Analysis

4.7.1 The Moderating Effect of Social Capital and Religion

To further explore the boundary conditions that influence the relationship between TPP and corporate tax avoidance, we examine whether this relationship varies depending on the levels of local social capital and religiosity. Prior literature suggests that strong informal institutions—such as civic norms and community values—play a significant role in shaping ethical and compliance behaviours, including tax practices (Boone et al., 2013; Hasan et al., 2017). Specifically, communities characterised by strong social cohesion or higher religiosity may exert external normative pressures that influence corporate decision-makers' attitudes toward tax avoidance.

Social capital is measured at the county level based on established proxies in the literature, capturing the strength of local civic engagement and trust (e.g., Hasan et al., 2017). Religiosity is defined as the proportion of the local population affiliated with organised religion, following the methodology outlined in Boone et al. (2013) using data from the Association of Religion Data Archives (ARDA). We interact each of these variables with TPP to assess their potential moderating effects.

As shown in **Table 4-11**, Column (1) presents the interaction between TPP and social capital. The coefficient of the interaction term (TPP * Soc Capital) is negative but statistically insignificant (-0.004; t = -1.27), suggesting that the effect of TPP on tax avoidance does not vary meaningfully across regions with different levels of social capital. In contrast, Column (2) includes the interaction between TPP and religiosity. The interaction term (TPP * RELIG) is positive and statistically insignificant (0.002; t = 0.74), indicating that local religious intensity does not significantly condition the influence of TPP on corporate tax behaviour either.

These results imply that while TPP shows a marginally significant negative association with CETR in Column (2) (-0.006; t = –2.11), consistent with our main findings that firms under greater technological scrutiny may engage in more tax avoidance (lower CETR), this effect is

not significantly altered by informal institutional contexts such as social capital or religiosity. One possible explanation is that peer pressure derived from technological competition may operate more through formal market and innovation channels than local ethical norms. Alternatively, the influence of informal institutions may already be internalized in managerial practices and thus exert limited additional moderating effects.

Table 4-11: The Moderating Effect of Social Capital and Religion

	(1) CETR	(2) CETR
TPP	-0.000	-0.006**
	(-0.04)	(-2.11)
Soc Capital	0.032*	-
	(1.66)	
TPP * Soc Capital	-0.004	-
	(-1.27)	
Religion	-	0.009
		(0.47)
TPP * Religion	-	0.002
		(0.74)
MTB	-0.002***	-0.002***
	(-6.71)	(-6.68)
LEV	-0.024***	-0.024***
	(-5.80)	(-5.75)
FI	0.058	0.057
	(1.55)	(1.54)
PPE	-0.060***	-0.059***
	(-5.79)	(-5.72)
INTAN	-0.008	-0.009
	(-1.32)	(-1.37)
EQUITY	0.785*	0.780*
	(1.95)	(1.94)
RD	-0.234***	-0.233***
	(-16.94)	(-17.07)
ROA	0.081***	0.081***
	(13.87)	(13.86)
CNOL	0.002	0.002
	(0.72)	(0.67)
NOL	-0.002***	-0.002***
	(-4.92)	(-4.96)
ACCRUALS	-0.000	-0.000
	(-0.05)	(-0.01)
MA	-0.033***	-0.033***
	(-2.90)	(-2.91)
SIZE	0.021***	0.021***
	(11.20)	(11.18)
CONSTANT	0.227***	0.249***
	(11.89)	(12.41)
N	18985	18985
R^2	0.143	0.143
adj. R^2	0.139	0.139

Notes: This table examines whether social capital and religiosity influence how TPP affects CETR. TPP is interacted with Soc_Capital and RELIG to test moderation effects. Firm-level controls are consistent with earlier models. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.7.2 The Moderating effect of CEO (Tenure/Age/Gender)

The results presented in **Table 4-12** provide further insight into how CEO characteristics—specifically tenure, age, and gender—may moderate the relationship between TPP and corporate tax avoidance, as measured by CETR. This analysis is part of our additional analysis and explores whether the personal attributes of firm leadership shape how external peer influence translates into tax-related corporate behaviour.

Table 4-12: The Moderating Effect of CEO

	(1) CETR	(2) CETR	(3) CETR
TPP	-0.002*	-0.016***	-0.010***
	(-1.74)	(-3.49)	(-2.69)
Tenure	0.021***	-	-
	(3.27)		
TPP * Tenure	-0.003**	-	-
	(-2.18)		
AGE	-	-0.000	-
		(-0.92)	
TPP * AGE	-	0.000***	-
		(3.73)	
Gender	-	-	-0.050**
			(-2.56)
TPP * Gender	-	-	0.011***
			(2.86)
MTB	-0.002***	-0.001**	-0.001**
	(-6.77)	(-2.11)	(-2.57)
LEV	-0.024***	-0.040***	-0.037***
	(-5.67)	(-4.46)	(-4.36)
FI	0.066*	-0.162***	-0.177***
	(1.74)	(-3.68)	(-4.18)
PPE	-0.058***	-0.097***	-0.088***
	(-5.56)	(-5.87)	(-5.68)
INTAN	-0.009	0.002	-0.002
	(-1.43)	(0.24)	(-0.24)
EQUITY	0.794*	-0.035	0.269
	(1.95)	(-0.06)	(0.50)
RD	-0.234***	-0.362***	-0.373***
	(-16.98)	(-9.43)	(-10.05)
ROA	0.081***	0.078***	0.081***
	(13.84)	(3.00)	(3.35)
CNOL	0.002	0.021	0.022
	(0.69)	(1.43)	(1.56)
NOL	-0.002***	-0.017***	-0.017***
	(-4.80)	(-5.32)	(-5.38)
ACCRUALS	-0.001	0.137***	0.133***
	(-0.17)	(5.66)	(5.96)
MA	-0.030***	-0.036**	-0.038**
	(-2.62)	(-2.28)	(-2.51)
SIZE	0.022***	-0.006*	-0.004
	(11.11)	(-1.72)	(-1.21)
CONSTANT	0.241***	0.319***	0.342***

	(35.02)	(10.85)	(16.24)
N	18768	7886	8710
R^2	0.143	0.131	0.126
adj. R^2	0.138	0.121	0.118

Notes: This table illustrates how CEO characteristics affect the TPP–CETR relationship. Interaction terms TPP * Tenure, TPP * Age, and TPP * Gender are used to assess the influence of executive experience, age, and gender diversity. All models include standard controls. Standard errors are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

Column (1) in **Table 4-12** introduces CEO tenure. The interaction term between TPP and tenure is negative and statistically significant (β = -0.003, p < 0.05), implying that longer-tenured CEOs strengthen the negative effect of TPP on CETR (an increase in tax avoidance). This aligns with prior literature (e.g., Cain & Mckeon, 2016), which finds that more entrenched CEOs may be less responsive to external scrutiny and more inclined to pursue aggressive financial strategies, including tax minimisation. These CEOs might have built internal influence and the experience to implement complex avoidance strategies without fear of reputational loss.

Column (2) examines CEO age. The positive and statistically significant interaction term (β = 0.000, p < 0.01) suggests that older CEOs weaken the negative impact of TPP on tax behaviour, leading to higher CETR and less tax avoidance. This result is in line with Hsieh et al. (2018), who argue that older executives are more risk-averse and likely to value legacy and regulatory compliance. As a result, they may be more likely to adopt conservative decision-making behaviours when subjected to external peer pressure.

Column (3) investigates CEO gender. The interaction between TPP and a female CEO indicator is positive and significant (β = 0.011, p < 0.01), demonstrating that under TPP, firms led by female CEOs are more likely to report higher CETR, and thus engage in less tax avoidance. This is consistent with findings from prior studies (e.g., Araújo et al., 2021) that women in executive roles tend to be more ethically driven and less likely to engage in aggressive tax practices.

Taken together, these findings emphasise the importance of CEO identity in shaping how external TPP affects tax decisions. Longer CEO tenure amplifies the tendency toward tax avoidance under TPP, whereas a greater CEO age or having female leadership attenuate it. These results support the growing body of evidence that corporate tax behaviour is not solely firm-driven but also person-driven, influenced by the values, risk tolerance, and ethical orientations of top executives.

4.8 Conclusion

This study investigates how technological peer pressure (TPP) influences corporate tax avoidance using a comprehensive panel dataset of 18,985 firm-year observations of U.S.-listed firms from 1996 to 2019. Building on the peer effects literature and organisational behaviour theories, we examine whether firms operating in technologically competitive environments are more or less likely to engage in tax avoidance strategies. Our analysis leverages a machine-learning-based measure of TPP, developed by Cao et al. (2018), and employs the long-run cash effective tax rate (CETR) as a proxy for tax avoidance. The baseline regression results reveal a significant negative relationship between TPP and CETR, indicating that firms exposed to higher technological peer pressure are more likely to engage in tax avoidance. This suggests that in dynamic and innovation-driven environments, competitive technological pressures intensify firms' incentives to exploit tax-saving strategies, as they prioritise financial flexibility to sustain innovation and growth.

To further explore the mechanisms behind this relationship, we test the moderating role of financial constraints. The results show that when firms face greater financial constraint, the negative effect of TPP on CETR becomes stronger, indicating that constrained firms respond to technological peer pressure by engaging more aggressively in tax avoidance. This pattern suggests that under resource scarcity, firms prioritise preservation of short-term liquidity over reputational concerns, using tax savings as a buffer to sustain operations and innovation efforts. These findings highlight the heterogeneous impact of TPP, where firms' internal financial capacity shapes the extent to which external competitive pressures influence tax behaviour.

To validate the robustness of our findings, we employ alternative measures of tax avoidance (long-run ETR) and multiple proxies for financial constraints (e.g., Delaycon and equity-to-debt ratio). Additionally, we apply instrumental variable (2SLS) regressions using the industry-state average of peer TPP as an instrument, and Propensity Score Matching (PSM) to mitigate endogeneity concerns. Across all methods and specifications, our results consistently confirm that TPP increases tax avoidance, particularly in financially constrained firms.

However, our additional analysis, including interaction terms for social capital and religiosity, does not reveal significant moderating effects. While prior studies (e.g., Boone et al., 2013; Hasan et al., 2017) suggest that these contextual factors may influence the ethical orientation of financial decision-making, our results indicate that, within the scope of our sample and model, neither social capital nor religiosity significantly alters the relationship between

technological peer pressure and corporate tax avoidance. We also examine whether CEO characteristics (tenure, age, and gender) influence the link between TPP and tax avoidance. Consistent with expectations, CEOs with longer tenures are associated with a greater tendency towards aggressive tax behaviour under TPP. In contrast, older and female CEOs appear to mitigate this effect, reinforcing the role of leadership traits in shaping firms' responses to peer-driven pressures. These findings further underscore the importance of managerial characteristics in moderating how external competitive forces translate into tax behaviour.

From a theoretical perspective, this study contributes to the literature by extending research on peer effects beyond operational and innovation outcomes to the domain of corporate tax behaviour. The findings demonstrate that technological peer pressure operates as a mimetic force that shapes firms' financial strategies, supporting institutional theory predictions regarding behavioural convergence under competitive pressure (DiMaggio & Powell, 1983). At the same time, the results align with resource dependence theory, highlighting how firms rely on tax avoidance as an internal financing mechanism when facing resource constraints. By integrating these perspectives, the study provides a more comprehensive explanation of how external peer dynamics and internal resource conditions jointly influence corporate tax decisions.

From a practical perspective, the findings offer important implications for regulators, policymakers, and investors. For regulatory authorities such as the IRS, the results suggest that firms operating in innovation-intensive and highly competitive environments may be more prone to engage in tax avoidance, particularly when financially constrained. This highlights the need for targeted monitoring strategies in industries characterised by high R&D intensity and rapid technological change. For policymakers, the findings emphasise the importance of designing tax policies that reduce firms' reliance on aggressive tax planning as a source of internal financing, for example by strengthening innovation-related tax incentives while maintaining transparency and compliance standards. For investors, understanding the role of peer pressure and financial constraints can provide additional insight into firms' tax strategies and risk profiles, particularly in competitive technological sectors.

Despite the important insights provided by this study, several limitations should be acknowledged. First, while our analysis offers robust evidence on the relationship between TPP and corporate tax avoidance, the proxy for technological peer pressure—based on machine-learning techniques—may not fully capture the complexity of peer interactions or informal industry networks. Second, the study is limited to U.S.-listed firms between 1996 and 2019,

which may restrict the generalisability of the findings to other institutional or technological contexts. Third, although we employ a range of control variables and endogeneity checks, unobserved factors may still influence the observed relationships.

Overall, our findings contribute to the understanding of how external peer dynamics and internal organisational features interact to shape corporate tax planning strategies. Rather than acting as a disciplining force, technological peer pressure primarily operates as a facilitating mechanism that increases tax avoidance, with the effect becoming even stronger under financial constraint. This underscores the importance of firm heterogeneity in determining how competitive technological environments translate into tax behaviour. Future research could extend this framework by examining cross-country settings, incorporating more granular measures of peer networks, and further exploring the interaction between technological competition and other institutional factors in shaping corporate tax behaviour.

Chapter 5

Summary and Conclusion

Chapter 5: Summary and Conclusion

5.1 Summary of Findings

The first of the three papers examines the association between local creative culture and corporate tax avoidance using county-level data from U.S. firms. The study employs the creative class share (CSHARE) as the primary proxy for creative culture, capturing the prevalence of occupations requiring innovative and problem-solving skills, and evaluates its relationship with long-run measures of tax avoidance, namely the cash effective tax rate (CETR) and GAAP Effective Tax Rate (ETR). Results from baseline regression models reveal a significant positive association between local creative culture and tax avoidance, suggesting that firms located in creative areas are more likely to utilise tax planning opportunities.

However, additional analyses reveal a more nuanced picture: while creative culture generally fosters greater willingness to take risks and embrace innovative approaches to taxation, firms located in highly creative regions may also exhibit more conservative behaviour when creative norms emphasise value creation and ethical alignment. Moreover, the study finds that uncertainties further condition this relationship. The evidence suggests that creative culture exerts a dual influence, encouraging aggressive tax planning through risk-taking and innovation, while also constraining such behaviour where long-term value orientation and stakeholder accountability dominate. The study concludes that local creative culture represents a significant informal institutional determinant of corporate tax behaviour, shaping both the direction and intensity of tax avoidance practices.

The second paper of the three investigates the impact of regulatory fragmentation on corporate tax avoidance by analysing a large panel of US-listed firms from 1995 to 2019. The study defines regulatory fragmentation as the multiplicity of overlapping agencies overseeing a single issue and incorporates regulatory intensity as a moderating factor to capture the strength of enforcement. Using regression models—Two-Stage Least Squares with instrumental variables, and Propensity Score Matching—produced results revealing a negative and statistically significant relationship between regulatory fragmentation and tax avoidance, suggesting that greater fragmentation constrains aggressive tax behaviour by raising compliance costs and oversight complexity. Moreover, the analysis shows that this deterrent effect is magnified in high-intensity regulatory environments, where stronger enforcement mechanisms reinforce the discipline imposed by fragmented oversight. Additional tests highlight that firms with high

levels of innovation and managerial ability are less likely to avoid taxes under regulatory fragmentation, while financially constrained firms exhibit a more limited capacity to exploit loopholes due to the resource-scarce nature of complex tax planning. Cultural conditions such as local creative culture and religiosity also align with this effect, further discouraging avoidance. The study concludes that regulatory fragmentation, when combined with high regulatory intensity, serves as an important institutional mechanism shaping corporate tax planning.

The third of the three papers examines the influence of technological peer pressure (TPP) on corporate tax avoidance, using a sample of 18,985 firm-year observations of U.S. public firms between 1996 and 2019. The TPP measurement is based on the R&D intensity of peer firms in related product markets, while tax avoidance is proxied by long-run CETR. Employing fixed effects regressions—Two-Stage Least Squares with instrumental variables, and Propensity Score Matching—the study finds a robust positive association between TPP and tax avoidance, indicating that firms facing stronger innovation-driven competition increasingly adopt aggressive tax strategies to preserve internal financial resources for R&D investment. The interaction with financial constraint is positive and significant, showing that firms with limited external financing opportunities rely more heavily on tax avoidance as a liquidity-preserving tool. From a theoretical standpoint, the findings are consistent with Institutional Theory, as mimetic pressures drive firms to imitate their peers' fiscal practices, and with Resource Dependence Theory, which emphasises the role of tax avoidance in securing and reallocating resources under resource scarcity. The study concludes that technological peer benchmarking extends beyond innovation strategies to tax planning, positioning tax avoidance as a complementary mechanism for sustaining competitiveness in resource-scarce environments.

Taken together, the findings from the three empirical studies provide a unified perspective on the external drivers of corporate tax avoidance. While each study examines a distinct dimension—local culture, regulatory structure, and technological peer pressure—the combined evidence suggests that corporate tax behaviour is shaped by the interaction of informal norms, formal institutional constraints, and competitive market pressures.

Specifically, local creative culture operates as an informal institutional force that can both encourage and constrain tax avoidance depending on prevailing norms. In contrast, regulatory fragmentation represents a formal institutional mechanism that systematically limits aggressive tax behaviour, particularly when enforcement intensity is high. At the same time, technological peer pressure introduces a competitive dynamic, whereby firms adopt tax avoidance strategies as a means of preserving resources in innovation-driven environments.

Importantly, these forces do not operate in isolation. Instead, they jointly define the boundaries within which firms make tax planning decisions. For example, while peer pressure and creative environments may incentivise risk-taking and innovation in tax strategies, regulatory structures impose constraints that discipline such behaviour. This interplay highlights that corporate tax avoidance is best understood as a function of multiple, interacting external environments rather than a single dominant factor. Overall, the thesis demonstrates that corporate tax behaviour in the U.S. is shaped by a complex configuration of cultural, regulatory, and competitive forces, offering a more holistic understanding that extends beyond traditional firm-level explanations.

5.2 Contributions

Beyond the individual contributions of each empirical study, this thesis offers an integrated contribution to the literature on corporate tax avoidance by developing a multi-dimensional framework that links informal institutions, formal regulatory structures, and competitive pressures. Unlike prior research that typically examines these factors in isolation, this thesis demonstrates that tax avoidance behaviour emerges from the interaction between cultural norms, regulatory complexity, and peer-driven incentives.

In doing so, the thesis extends existing literature in three important ways. First, it broadens the scope of tax avoidance research by incorporating external environmental factors beyond traditional firm-level determinants. Second, it provides empirical evidence that both constraining forces (e.g., regulatory fragmentation) and enabling forces (e.g., peer pressure and creative culture) coexist and jointly shape corporate behaviour. Third, it offers a unified empirical setting—the United States—that allows for the simultaneous examination of these factors within a consistent institutional context.

As a result, the thesis contributes to a more comprehensive understanding of corporate tax avoidance as an outcome of interacting institutional and competitive dynamics rather than isolated decision-making processes.

5.2.1 First Paper Contributions

This study extends the literature by examining the influence of local creative culture on corporate tax avoidance, an area that has received limited empirical attention. First, it contributes by introducing a novel institutional dimension—creative culture—as a determinant of firms' fiscal behaviour, complementing prior work on social capital and religiosity (Boone et al., 2013; Hasan et al., 2017). By operationalising creative culture through county-level

creative class share, the study demonstrates how local norms and values associated with innovation and risk-taking translate into more aggressive tax strategies. This reinforces recent findings that creativity can also shape opportunistic corporate behaviour (Hasan et al., 2023). Second, it enriches methodology by employing long-run measures of tax avoidance (CETR and ETR), consistent with prior tax literature (Dyreng et al., 2008; Chen et al., 2010; Lisowsky et al., 2013), to mitigate year-to-year fluctuations and ensure robust results that better reflect structural patterns of corporate behaviour.

The paper also offers evidence on how creative culture interacts with firm-specific characteristics, namely that uncertainty amplifies the link between creative environments and tax avoidance. Finally, the study contributes to theory by highlighting the duality of creative culture: while it fosters innovation-driven risk-taking that legitimises avoidance, it may also embed ethical standards that constrain such practices. From the perspective of Institutional Theory (DiMaggio & Powell, 1983), creative culture operates as a normative pressure that legitimises unconventional practices such as tax avoidance, while under Resource Dependence Theory (Pfeffer & Salancik, 1978), firms in creative regions may strategically deploy tax avoidance to preserve resources for innovation. Together, these insights advance the understanding of informal institutional drivers of tax behaviour, positioning creative culture as a critical yet underexplored factor shaping fiscal decision-making.

5.2.2 Second Paper Contributions

This study provides one of the first comprehensive analyses of how regulatory fragmentation influences corporate tax avoidance across a large, international sample. It contributes to knowledge in several ways. First, it identifies regulatory fragmentation as a structural determinant of tax avoidance, bridging a gap in the literature that has often considered regulation and taxation separately (Kalmenovitz et al., 2022; Nicoletti & Scarpetta, 2002). Second, by introducing regulatory intensity as a moderating factor, the study demonstrates that enforcement strength amplifies the deterrent impact of fragmented oversight, providing new insights into the interplay between regulatory architecture and compliance behaviour. Third, it adds methodological value by applying instrumental variable 2SLS estimation and PSM to mitigate endogeneity concerns, thereby strengthening causal inference, in line with methodological calls in the governance and taxation literature. Fourth, the analysis provides evidence that firms with high innovation capacity and strong managerial ability respond differently to regulatory fragmentation than resource-constrained firms do, suggesting that firm-level heterogeneity shapes responses to institutional structures. Finally, the study

contributes to Institutional Theory (DiMaggio & Powell, 1983) by showing that fragmented, yet intensive regulatory environments can improve compliance and limit tax avoidance, reinforcing the role of governance complexity as a disciplining mechanism (Alm, 1988; Lorenz et al., 2023).

5.2.3 Third Paper Contributions

This final study makes a distinct contribution by introducing technological peer pressure as a novel determinant of corporate tax avoidance. First, it expands the literature on peer effects (Cao et al., 2018; Cao et al., 2023) by moving beyond innovation outcomes to examine how peer benchmarking shapes fiscal behaviour, demonstrating that technological rivalry has spillover effects on tax strategies. Second, it highlights the contingent role of financial constraint, showing that constrained firms are more likely to translate peer-driven innovation pressure into aggressive tax avoidance as a liquidity-preserving mechanism. Third, the paper makes a methodological contribution by combining fixed effects regressions, 2SLS with instrumental variables, and PSM, offering robust evidence across alternative estimation strategies, consistent with approaches in the corporate taxation literature (Dyreng et al., 2008). Fourth, the study advances theory by integrating Institutional Theory (DiMaggio & Powell, 1983) and Resource Dependence Theory (Pfeffer & Salancik, 1978), showing how mimetic pressures normalise avoidance practices while resource scarcity compels firms to use tax planning as a means of sustaining competitiveness. Finally, the findings enrich policy debates by illustrating how competitive pressures in innovation-driven industries interact with financial conditions to shape corporate tax behaviour, suggesting that tax compliance cannot be understood in isolation from broader market and institutional contexts.

5.3 Implications

5.3.1 Theoretical Implications

From a theoretical perspective, the findings of this thesis provide important insights into how corporate tax avoidance is shaped by multiple external forces. The results support Institutional Theory by demonstrating that both formal institutions (e.g., regulatory fragmentation) and informal institutions (e.g., local culture) play a central role in shaping firm behaviour. At the same time, the findings extend Resource Dependence Theory by highlighting how firms strategically use tax avoidance to secure financial resources in response to competitive pressures such as technological peer dynamics.

More importantly, the thesis shows that these theoretical mechanisms do not operate independently. Instead, firms simultaneously respond to normative pressures, regulatory constraints, and competitive incentives. This integrated perspective advances the literature by moving beyond single-theory explanations and proposing a more comprehensive framework for understanding corporate tax behaviour.

5.3.2 Practical Implications

From a practical and policy perspective, the findings of this thesis offer several important implications for regulators, tax authorities, and investors. In regions characterised by strong creative cultures, tax enforcement agencies may need to adopt targeted monitoring strategies, as firms in these areas are more inclined to experiment with aggressive tax planning. At the same time, firms located in creative regions should be encouraged to leverage their innovative capabilities towards value-adding projects rather than excessive reliance on tax avoidance. This could be achieved by introducing incentives that link creative outputs—such as patents or R&D achievements—with responsible tax behaviour, thereby balancing innovation with compliance.

Building on the evidence from paper 2, which reveals that regulatory fragmentation reduces tax avoidance, particularly in high-intensity enforcement environments, the study recommends that regulatory authorities should enhance coordination across agencies while maintaining rigorous oversight standards. Rather than reducing the number of regulatory bodies, efforts should focus on improving inter-agency communication and consistency to ensure that fragmentation translates into effective compliance rather than inefficiency. Furthermore, governments should strengthen regulatory intensity, particularly in sectors prone to aggressive tax behaviour, as stronger enforcement magnifies the deterrent effect of fragmented oversight. Firms, on their part, should recognise that aligning with regulatory expectations not only reduces compliance risks but can also improve long-term performance by signalling transparency and accountability to stakeholders.

Based on the findings of paper 3, which show that technological peer pressure increases tax avoidance—especially among financially constrained firms—the study recommends that regulators and investors pay closer attention to industries characterised by high R&D intensity and rapid innovation. In such contexts, firms may be more likely to treat tax avoidance as a mechanism to preserve financial resources for sustained innovation. Policymakers should therefore design tax incentives that reduce the need for aggressive avoidance, such as R&D tax credits tied to transparent reporting. Additionally, industry associations could play a role in promoting responsible fiscal practices by encouraging firms to benchmark not only on

technological uptake and output but also on ethical and compliant tax behaviours. Firms themselves should seek to balance the pressure to innovate with sustainable financial practices, recognising that reputational costs associated with aggressive tax strategies may undermine long-term competitiveness.

Collectively, the recommendations from the three studies highlight the need for a multi-faceted policy approach that integrates cultural, regulatory, and competitive dynamics. Policymakers should combine targeted monitoring in creative regions, stronger inter-agency coordination in fragmented regulatory systems, and tailored tax incentives in innovation-driven industries. Firms should, in turn, align innovation and resource strategies with responsible tax practices to maintain legitimacy and stakeholder trust. These recommendations are particularly important as governments and corporations navigate an increasingly complex environment where cultural norms, institutional structures, and peer competition jointly shape fiscal behaviour.

5.4 Study Limitations and Avenues for Future Research

In the first paper, the study focuses exclusively on U.S. firms, which may limit the generalisability of findings since institutional and cultural contexts vary across countries. While the evidence highlights the influence of creative culture on tax avoidance, other unobserved local factors may also shape managerial decision-making in ways not fully captured by the present design. Future studies may therefore extend the analysis to cross-country settings and incorporate alternative measures of informal institutions, thereby providing a broader perspective on how cultural environments interact with fiscal behaviour.

In the second paper, the analysis is also confined to U.S. firms and is constrained by the availability of detailed data on regulatory fragmentation. Although the results demonstrate that such fragmentation, particularly when combined with regulatory intensity, significantly inhibits tax avoidance, the dynamics may differ in jurisdictions where institutional structures and enforcement mechanisms follow different logics. Future research could expand this inquiry to other regions, explore longitudinal changes in regulatory coordination, and consider alternative governance mechanisms that may mediate or moderate the link between regulatory fragmentation and corporate tax planning.

In the third paper, while robust evidence is presented on the relationship between technological peer pressure and tax avoidance, the study does not fully capture the subtleties of peer networks or informal industry norms that may also drive fiscal behaviour. Additionally, the focus on

U.S.-listed firms between 1996 and 2019 limits the applicability of results to other institutional or technological contexts. Future research may usefully explore cross-country samples, adopt more granular measures of peer influence, and investigate the interaction between technological rivalry and other informal institutional factors.

Collectively, the limitations identified across the three papers highlight practical avenues for future inquiry. Expanding the scope to diverse regions and industries, integrating additional institutional and cultural variables, and adopting more fine-grained methodological approaches could provide a richer understanding of how cultural, regulatory, and peer-driven pressures shape corporate tax behaviour.

In conclusion, this thesis provides a comprehensive examination of corporate tax avoidance by integrating cultural, regulatory, and competitive perspectives within a single empirical setting. By demonstrating how these forces interact, the study contributes to a deeper and more nuanced understanding of corporate tax behaviour in complex institutional environments. The findings highlight that effective policy design and corporate governance require a holistic approach that accounts for the interplay between informal norms, formal regulation, and market dynamics.

Appendix (Variable Definitions)

Variables	Definition
Dependent	
CETR	The cash effective tax rate = the total taxes paid in cash over the last five years scaled by total pre-tax income net of total special items over the same period (CETR = TXPD5 / PI5 – SPI5)
ETR	The effective book tax rate = the ratio of total tax expense over the most recent five years scaled by total pre-tax income net of total special items over the same period (ETR = TXT5 / PI5 – SPI5)
Independent	
CSHARE	The proportion of the creative class in a given county in percentage points, from http://www.ers.usda.gov/data-products/creative-class-county-codes/
Reg_Frag	1 − ∑Topic ∑ Agency, P, Firm, Topic, Yearω2 Topic, Agency, Year, equivalently estimated as a weighted sum across all 100 topics of the dispersion of each topic across agencies (ω2 Topic i, Year t, Agency), where weights equal the topic probability in the firm's annual report (Kalmenovitz et al., 2022)
TPP	Following Cao et al. (2018), technological peer pressure for firm i at the end of fiscal year t: TPP_{i,t} = ln[1 + (1 / G_{i,t}) * Σ_{j≠i} (ω_{ij} × G_{j,t})] (Firm i's technological threat coming from a peer firm j's R&D stock G_{j,t} at the end of year t, weighted by the closeness ω_{ij} between these two firms, where ω_{ij} = ⟨(v{i}/‖V{i}‖) · (v_{j} / ‖V_{j}‖)⟩, V{i} is the vector of firm i's sales with the k- element being the share of firm i's total sales in the preceding two years made in industry (four-digit SIC) k) TPP measure: http://guangma.info/data.html
Control Variables	
MTB	Market-to-book ratio defined as market value of equity (CSHO x PRCC_F) divided by common equity (CEQ)
LEV	Debt in current liabilities (DLTT + DLC) divided by total assets at the beginning of the year (AT)
FI	Pre-tax income for year t (PIFO) scaled by total assets at the beginning of the year (AT), where PIFO is equal to 0 if there is no pre-tax income

Variables	Definition
PPE	Net PPE for year t (PPENT) scaled by total assets at the beginning of the year (AT)
EQUITY	Equity income for year t (ESUB) scaled by total assets at the beginning of the year (AT)
RD	R&D expense for year t (XRD) scaled by total assets (AT)
ROA	Return-on-assets = operating income before depreciation (OIBDP) scaled by total assets (AT)
CNOL	Change in tax-loss carryforward (TLCF) from year t-1 to year t scaled by total assets (AT) at the beginning of the year
NOL	The balance of tax loss carryforwards (TLCF) divided by total assets (AT), where NOL is equal to 0 if there are no tax loss carryforwards
ACCRUALS	Accruals are measured as income before extraordinary items (IB) minus operating cash flows (OANCF), plus extraordinary items and discontinued operations (XIDOC), scaled by total assets at the beginning of the year (AT). Formally: ACCRUALS = [IB − OANCF + XIDOC] / AT
MASCORE	The residual from a firm efficiency estimation model used in Demerjian et al. (2013), see http://faculty.washington.edu/pdemerj/data.html
SIZE	The natural logarithm of total assets (AT)
PT	Patent data are obtained from the University of Virginia Patent Database and measure firms' patenting activity. Further details on the construction of this variable are available at: https://patents.darden.virginia.edu/get-data/
Topic _Dis	1 − ∑Topic P2 Firm f, Year t, Topic, where P firm f, Year t, Topic = the fraction of the annual report of firm f dedicated to a given topic (Kalmenovitz et al., 2022)
Reg _Quantity	∑Topic P2 Firm f, Year t, Topic log (Topic Words, Fed reg), where natural logarithm of the number of words log (Topic Words, F e c reg) is the natural logarithm of the number of words in each topic (Kalmenovitz et al., 2022)
RegIn	Regulatory intensity data obtained from the Federal Register, following the construction method of Kalmenovitz (2023)
Tax Uncertainty	Tax uncertainty is (TXTUBEND) scaled by total assets (AT)
Uncertainty Dummy	Equals 1 if the percentage of uncertainty above the median, and 0 otherwise

Variables	Definition
SA index	SA index calculated as: $(-0.737 * \text{Size}) + (0.043 * \text{Size2}) - (0.040 * \text{Age})$, where Size equals the log of inflation-adjusted book assets, and Age is the number of years the firm is listed with a non-missing stock price on Compustat
SA Dummy	Equals 1 if the percentage of financial constraints is above the median, and 0 otherwise
Delaycon EQ_ Debt	Text-based measure of financial constraints developed by Hoberg et al. (2015) and text-based measure of financial constraints developed by Linn and Weagley, 2023)
Financial Distress	A dummy variable equal to 1 if (i) the firm's leverage is in the top two deciles of its industry in a particular year, and (ii) its coverage ratio is < 1 for two consecutive years or < 0.8 in any given year, and 0 otherwise
Innovation	Innovation data are obtained from Kai Li and are developed following Li et al. (2021). This variable captures firm-level innovation activity based on the measure constructed in their study.
RELIG	Religious adherence calculated as state-level adherents divided by state-level population; data collected from the Association of Religious Data Archives (ARDA) https://www.thearda.com/rcms2010/index.asp
Social Capital	Following Hasan et al. (2016), social capital constructed using data provided by NRCD at Pennsylvania State University
Innovation	Kai Li provided data developed by Li et al. (2021)
CEO Data	CEO data collected from Compustat Execucomp: CEO's age, gender, and tenure

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