Int. J. Nonlinear Anal. Appl. In Press, 1–22
ISSN: 2008-6822 (electronic)
http://dx.doi.org/10.22075/ijnaa.2026.40008.5597

Corporate tax responsibility and tax planning

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(Communicated by Majid Eshaghi Gordji)

Abstract

Efforts to enhance tax revenues while promoting transparency and fairness in taxation not only bolster government income, facilitate equitable wealth distribution, and combat the underground economy but also contribute to the fulfillment of corporate social responsibility in the tax domain. Corporate tax responsibility can be positioned as a secondary objective within corporate tax policies, alongside primary operations, thereby encouraging timely tax payments, the discharge of societal obligations, and adherence to tax regulations. The objective of this study is to examine the influence of the dimensions of corporate tax responsibility on tax planning among companies listed on the Tehran Stock Exchange. This research adopts a descriptive-correlational design, is applied in nature, and employs secondary data collection methods. To assess the relationship between the dimensions of corporate tax responsibility and tax planning, the Long Short-Term Memory (LSTM) neural network approach was utilized. The study covers the period from the beginning of 2016 to the end of 2023, with a sample of 105 companies selected via systematic elimination; observations from these firms were analyzed. The results reveal that corporate tax responsibility exerts a significant negative effect on tax avoidance. Furthermore, it has a significant negative impact on tax risk, with both components of tax planning exhibiting a substantial decline as corporate tax responsibility increases. Although current government policies primarily emphasize revenue growth through penalties for tax offences or incentive-based measures, fostering corporate tax responsibility internally within organizations—through cultural development-can reduce monitoring and collection costs for both the government and firms. Thus, corporate tax responsibility may serve, on one hand, as an innovative corporate governance mechanism to mitigate future non-compliance risks for companies and, on the other, as a policy tool for authorities to ensure taxpayer compliance.

Keywords: Tax planning, Corporate tax liability, Tax risk, Tax avoidance
2020 MSC: Primary 91B64; Secondary 62M45, 62P20

1 Introduction

Tax revenue is the most important source of revenue for a country. However, the biggest challenges related to tax administration in countries around the world continue to be issues related to tax evasion, fraud and other tax risks. High-risk tax behaviors such as tax evasion and fraud cause serious tax losses, tax base erosion and damage to national tax security. At the same time, such behaviors disrupt the economic order of the market and create unfair competition. The average total tax revenue loss in the United States from 2011 to 2013 was estimated at $441 billion per year. In the European Union, the average tax loss share is 18.3 percent, according to data provided

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Received: December 2025 *Accepted:* January 2026

in 2015. In Switzerland, the country with the lowest share, tax loss is still equivalent to 6.9 percent of GDP. The World Bank estimates that 54 percent of companies in 135 developing countries do not declare all their income taxes to the tax authorities. Therefore, combating and correcting risky tax behaviors is a vital requirement for regulating market order, maintaining fairness and justice, and enhancing national governance capacity [1]. In Iran, taxes have consistently been one of the primary sources of government revenue. Various upstream documents, such as the 20-Year Vision Document, five-year development plans, and the economic transformation plan, have emphasized the need to increase the country's tax revenues. However, tax evasion remains a major obstacle to achieving targeted government tax revenues and continues to be an unresolved challenge and concern [2].

Tax planning encompasses all transactions and arrangements aimed at reducing a company's tax liabilities. Traditional economic theory views tax planning as a value-adding activity and predicts that rational managers will engage in it when the benefits outweigh the costs. This perspective is grounded in the idea that corporate tax savings generate positive cash flows that directly or indirectly benefit shareholders and managers [3]. In contrast, the agency theory perspective suggests that opportunistic managers may exploit tax planning to pursue personal interests at the expense of shareholders. Despite these differing views on motivations, both theoretical frameworks highlight the central role of tax considerations in corporate decision-making [5].

Corporate tax minimization strategies are typically classified based on their legality and can manifest in forms such as tax evasion, tax avoidance, and tax risk-taking. Tax evasion involves illegal actions, deception, and fraud, whereas tax avoidance refers to strategies that remain within legal boundaries, often exploiting weaknesses in tax laws [6]. The risks and costs associated with tax avoidance vary depending on the specific activity. Tax avoidance encompasses a broad spectrum of tax planning practices that differ significantly in complexity, legality, and the certainty of tax savings [7]. Tax risk is defined as the magnitude and likelihood of unexpected outcomes arising from uncertain tax positions that may impact firms. It can stem from tax planning activities or result in long-term tax avoidance consequences [8].

Viewing taxation as an area of corporate discretion challenges the traditional assumption that governments alone are responsible for ensuring a fair tax system and extends this responsibility to corporations. Accordingly, corporate tax policies are increasingly integrated into the framework of corporate social responsibility (CSR) to encourage ethical and socially desirable tax practices. This intersection has garnered growing academic attention, with an increasing number of studies exploring the relationship between taxation and social responsibility. Hanlon and Heitzman [9] are widely cited for their comprehensive review of tax research in the accounting literature, where they identify the link between taxation and CSR—particularly in the context of tax avoidance—as a promising area for future research. Although corporate tax payments were largely overlooked in CSR discussions for decades, in recent years, corporate tax behavior has emerged as a key topic in the broader CSR debate [10].

The relationship between corporate tax planning and corporate social responsibility is complex and multifaceted, encompassing conflicting viewpoints that require rigorous scientific analysis. This complexity stems from the tension between maximizing shareholder value through aggressive tax strategies and fulfilling societal expectations of ethical conduct and transparency [11].

However, the social responsibility literature still lacks a comprehensive understanding of the essentials of corporate responsibility in the field of taxation. Achieving this awareness is a preliminary but necessary step towards providing a solid basis for addressing the thinking and practices of tax and stakeholders (including policymakers) to hold companies accountable for their tax behavior. Moreover, given the emergence of social responsibility and the great attention paid to it, a comprehensive and up-to-date understanding of the place of tax in social responsibility is much needed. The present study, in a different approach, seeks to reveal the consequences of corporate tax responsibility on tax planning. In other words, the study can present the idea that despite the high importance of social responsibility and the need for companies to invest and spend in this area, corporate tax responsibility can pave the way for the implementation of social responsibility policies by the government by making companies adhere to paying their taxes, and companies simply pay their share of this responsibility through paying taxes. From a practical perspective, this study can help to improve the social capital of companies and fulfill their responsibility towards their stakeholders, because the existence of class gaps in society is rooted in the lack of fair distribution of wealth, and reforming the tax culture in companies as an effective part of the country's tax revenues can play a significant role in this regard. In addition, various professions in the era of scientific prosperity and rapid technological changes are adapting to the upcoming conditions, and this issue necessitates the specialization of topics in accounting, especially social responsibility accounting, and ultimately improves the tax compliance of companies in the context of tax responsibility. Therefore, the research will seek to find an answer to the following question:

Does corporate tax responsibility have a significant impact on tax planning (tax avoidance and tax risk) in companies listed on the Tehran Stock Exchange?

2 Theoretical Foundations

Managers in organizations face ethical issues almost every day in their professional lives, and few decisions lack an ethical dimension. Taxation, a concept as ancient as government itself, requires broad participation to fund public operations. In the corporate realm, ethics serve as a guiding compass for business practices and decision-making processes. As Crane and Matten [12] emphasize, business ethics encompass the principles underlying responsible conduct, including transparency, accountability, and fairness. These principles are particularly critical in taxation, where companies are expected to contribute equitably to the societal infrastructure from which they benefit. Although tax regimes vary significantly across jurisdictions, they remain essential for financing public goods and services. Corporations engage in tax planning to navigate a complex array of legal requirements [13].

Ethical theories, such as utilitarianism and deontology, provide foundational frameworks for evaluating the moral aspects of tax planning. Utilitarianism prioritizes the greatest good for the greatest number, suggesting that tax planning decisions should be assessed based on their societal consequences [14]. In contrast, deontological ethics emphasizes adherence to duties and moral rules—such as honesty and fairness—which may conflict with aggressive tax minimization strategies [15]. Accordingly, Huseynov and Klamm [16] noted that "tax avoidance, for whatever reason, may be viewed by some as socially irresponsible, i.e., a company not paying its fair share." Some firms prioritize being "good" citizens, fostering a corporate culture that encourages socially responsible activities, including paying a fair share of taxes [17]. In this context, Christensen and Murphy [18] rhetorically argued that "tax revenues are the lifeblood of the social contract" and that this contract underpins corporate social responsibility.

According to legitimacy theory, companies seek to maintain their societal legitimacy by aligning with community expectations through an implicit social contract [4]. One key mechanism for demonstrating legitimacy is corporate social responsibility (CSR). Legitimacy can be seen as a "status" threatened by aggressive tax strategies, potentially creating a legitimacy gap. To close this gap, firms may increase CSR reporting when threats relate to social issues [19]. A company aiming to establish or restore legitimacy might achieve this by disclosing CSR activities or paying higher taxes, provided both are viewed as acceptable pathways.

Tax planning within organizations is shaped by (a) agency conflicts arising from the separation of ownership and management, (b) societal needs, and (c) the perceived legitimacy of such actions. Traditional theory posits that tax avoidance reduces liabilities and enhances shareholder value [20]. To evade detection by tax authorities, managers often employ complex transactions for tax planning [21]. Conversely, social-oriented theories regard tax avoidance as irresponsible behavior toward society [22]. In this vein, Aslamrud [24] explained that firms with high CSR scores tend to be more cautious about tax avoidance, as aggressive practices can neutralize the positive impact of socially responsible actions and damage corporate reputation [25].

Under legitimacy theory, companies—like other taxpayers—have the right to minimize tax obligations within legal bounds [26]. From this perspective, managers view tax avoidance not as unethical but as a legitimate pursuit of higher profits and personal incentives [27]. However, such activities often conflict with societal expectations and pose legitimacy risks [18]. This tension has elevated tax payments to a component of corporate social responsibility. CSR represents a key element of business ethics, addressing the societal role of firms. It encompasses duties and obligations that companies must fulfill to preserve, protect, and support the communities in which they operate [29].

Studies across various countries demonstrate that when tax payments lose social justification, non-compliance becomes normalized, supplanting compliance as a dominant norm in formal and informal institutions. For instance, governmental opacity in spending tax revenues—or the intangibility of benefits in health, municipal services, education, sports, green spaces, and welfare—erodes public trust, a core element of social capital that critically influences compliance and tax offenses. The role of the Tax Affairs Organization, educational systems, and media in fostering a tax culture and building societal trust among taxpayers should not be overlooked [30, 31]. These challenges underscore the necessity of corporate tax responsibility within business ideologies. Corporate tax responsibility is increasingly viewed as a mechanism that, combined with reforms to the international tax framework, can promote accountable tax behavior, yielding more responsible outcomes while balancing social needs and corporate financial interests [32].

On the other hand, some companies—believing they can deploy resources more effectively than governments—prioritize direct CSR activities and assume lesser tax obligations. This lack of tax responsibility hampers governments' capacity to provide public goods and uphold basic human rights, particularly in the world's poorest nations [33]. For these reasons, tax avoidance is widely regarded as a "significant policy and moral issue" [34]. Policy-wise, national and international tax reforms are essential for a sustainable system; ethically, attention focuses on corporate discretion in taxation [35].

From an individual standpoint, responsibility is an internal obligation to fulfill self- or externally assigned duties willingly, accepting accountability for outcomes. Thus, responsible individuals strive to perform tasks accurately and

legally to avoid errors or legal repercussions [36].

Integrated and complementary theories explore how firms address social demands by linking taxation to broader CSR issues. These theories posit that businesses rely on society for existence, continuity, and growth. Research on corporate tax responsibility's contribution to CSR yields mixed results. Some studies indicate that firms with stronger CSR performance are less prone to tax avoidance, viewing tax contributions as complementary to overall CSR engagement [37, 48]. Consistent with the notion that paying taxes is socially responsible, evidence shows firms in high-social-capital regions engage less in tax avoidance [38, 39]. Conversely, other studies find that high-CSR firms are more likely to avoid taxes or that tax-avoidant firms often proclaim extensive CSR commitments [40]. To explain this, researchers suggest firms may not always see tax payments as the optimal path to CSR goals [41], treating avoidance as a means to free resources for other social or environmental investments [42]. Alternatively, CSR practices among tax-avoidant firms may serve as risk management to mitigate public scrutiny of their tax behavior [43]. These contradictory findings highlight varying corporate perceptions of tax obligations, shaping distinct moral duties and behaviors.

Ethical theories offer normative foundations for responsible corporate tax conduct. A final stream of research adopts a normative lens to establish moral grounding for corporate tax responsibility, framing CSR as an obligatory duty to maximize societal benefits irrespective of direct firm gains [44]. While some works broadly reflect on tax payment as a moral duty [45, 46], others draw on specific ethical philosophies to deem tax avoidance unethical. For consequentialists, utilitarian arguments hold that the societal harms of corporate tax avoidance likely outweigh shareholder benefits [47]. Payne and Raiborn [49] applied John Rawls's framework to argue that tax avoidance exacerbates inequalities and cannot benefit the least advantaged in society [50]. Finally, sustainable development provides another value-based lens: Bird and Davis-Nozemack [51] contend that neglecting fiscal responsibility depletes shared resources essential for equitable social relations, requiring sustainable protection. Moreover, shifting to responsible tax practices is deemed vital for the 2030 Agenda for Sustainable Development, adopted by UN member states in 2015 [52]. Thus, diverse ethical and philosophical perspectives furnish robust moral rationales for corporate tax responsibility.

3 Research Background

Monjia and Vahidi [53] conducted a study titled "The Effect of Corporate Social Responsibility, Financial Leverage, Firm Size, Return on Assets and Independent Board of Directors on Tax Planning". The findings show that return on assets, corporate social responsibility, independent board of directors and financial leverage have a negative effect on tax planning. Meanwhile, firm size has a positive effect on tax planning. Overall, this study provides empirical evidence on the importance of return on assets, corporate social responsibility, independent board of directors, financial leverage and firm size in tax planning. Nofitasari [54] conducted a study titled "Analysis of Tax Planning Strategies to Optimize the Tax Burden of Firms: A Review of the Literature". The findings show that tax planning, including the use of tax incentives and transfer pricing, is widely used by companies to minimize tax liabilities. However, the success of these strategies depends on various factors such as the size of the company, the complexity of tax laws, and the organization's capacity to manage the associated risks. Despite their potential benefits, these strategies often face challenges such as legal risks and the need for continuous monitoring of tax regulations. Silva et al. [9] conducted a study on "The Impact of Social Responsibility Practices on Tax Planning". The results show that the social, corporate governance, environmental, or economic components of corporate social responsibility do not affect tax planning. However, the results show that company size has a negative impact on tax planning, i.e. larger companies have lower effective tax rates. Eslami et al. [55] conducted a study on "Corporate Social Responsibility Modeling in the Field of Taxation and Accounting (Case Study: Industrial Companies)". The results indicate the effect of social performance on improving performance in industrial companies. The results of the training analysis also indicate the moderating role of tax incentives and creative accounting in the relationship between social responsibility and financial performance. Niazi et al. [56] conducted a study on "Identifying and ranking factors affecting the increase in Iranian participation in paying taxes". Based on the research findings, 10 factors affecting the increase in public participation in paying taxes were identified, including political, legal, education and awareness factors, demographic, economic, cultural, social, managerial and psychological characteristics. The analysis of the relationships between variables led to the extraction of a four-level model, in which political factors and demographic characteristics are placed at the fourth level, legal factors at the third level, educational factors, economic, cultural, social and psychological characteristics at the second level, and organizational and managerial factors at the first level. Political and demographic factors have the greatest and highest impact on the tendency to pay taxes. Rabi-Beigi et al. [57] studied "Presenting a tax morale model with a grounded theory approach". The results show that the tax morale model is centered around the central category of cyberspace, democracy, and advertising, which is shaped by causal conditions. This process begins with causal conditions and leads to the formation of a central category that helps to strengthen tax morale by using strategies,

and its outcome is the improvement of economic indicators, improvement of social indicators, and the fight against money laundering. Lack of tax justice, agility, and complexity of tax laws are also conditions that interfere with the tax morale model, and culture-building and establishing tax justice are considered strategies for strengthening tax morale.

Munjiah and Wahyudi [53] conducted a study titled "The Influence of CSR, Leverage, Firm Size, Return on Assets, and Independent Board of Commissioners on Tax Planning." The findings indicate that return on assets, corporate social responsibility, independent board of commissioners, and financial leverage have a negative effect on tax planning, while firm size has a positive effect. Overall, this study provides empirical evidence on the importance of these factors in shaping corporate tax planning practices.

Nofitasari [54] conducted a study titled "The Analysis of Tax Planning Strategies for Optimizing Corporate Tax Burdens: A Literature Review." The findings reveal that tax planning strategies, including the utilization of tax incentives and transfer pricing, are widely employed by companies to minimize tax liabilities. However, the effectiveness of these strategies depends on various factors, such as company size, the complexity of tax laws, and the organization's ability to manage associated risks. Despite their potential benefits, these approaches often encounter challenges, including legal risks and the necessity for ongoing monitoring of regulatory changes.

Silva et al. [58] conducted a study titled "The Influence of Social Responsibility Practices on Tax Planning: An Empirical Study for Companies Listed on Euronext Lisbon." The results show that the social, corporate governance, environmental, or economic dimensions of corporate social responsibility do not significantly affect tax planning. However, company size has a negative impact on tax planning, meaning that larger companies tend to exhibit lower effective tax rates.

Salami et al. [52] conducted a study titled "Modeling Corporate Social Responsibility in the Field of Taxation and Accounting (Case Study: Industrial Companies)." The results demonstrate the positive effect of social performance on overall performance in industrial companies. Additionally, the analysis highlights the moderating role of tax incentives and creative accounting in the relationship between corporate social responsibility and financial performance.

Niazi et al. [44] conducted a study titled "Identifying and Ranking the Factors Affecting the Increase of Iranian Participation in Paying Taxes." The research findings identified 10 key factors influencing public participation in tax payment, including political, legal, educational and awareness-related, demographic, economic, cultural, social, managerial, and psychological factors. Analysis of variable relationships yielded a four-level model: political factors and demographic characteristics at the fourth (foundational) level; legal factors at the third level; educational, economic, cultural, social, and psychological factors at the second level; and organizational and managerial factors at the first (most direct) level. Political and demographic factors exert the greatest influence on the propensity to pay taxes.

Rabi Beigi et al. [49] investigated "Presenting a Model of Tax Morale with a Grounded Theory Approach." The results indicate that the tax morale model revolves around a central category encompassing cyberspace, democracy, and advertising, shaped by causal conditions. This process originates from causal conditions, leading to the formation of the central category, which strengthens tax morale through specific strategies. Outcomes include improved economic indicators, enhanced social indicators, and efforts to combat money laundering. Interfering conditions—such as lack of tax justice, regulatory agility deficits, and complexity of tax laws—are identified, while culture-building and establishing tax justice emerge as key strategies for bolstering tax morale.

3.1 Research Methodology

The present study is in the group of applied studies in terms of its purpose. Also, the research method is descriptive in terms of its nature and content. From a methodological perspective, the research is of an applied type and the data used are of a mixed type (year-company). The time dimension of the research is retrospective and the deductive method has been used to interpret the results. The collection of foundations and literature was done by library studies and the data was also collected by relying on the data mining method. In order to predict the dependent variables through independent and control variables, a neural network has been used. In this LSTM neural network architecture, the model input is defined as a sequence of features. Then this sequence enters the LSTM layer, which has the ability to learn temporal relationships between data. The LSTM layer, using short-term and long-term memory cells, understands the patterns in the temporal changes of features and maintains sequence-dependent information. The output of this layer is extracted as a compressed vector of temporal information. Usually, this layer is set in a way that only transfers the last hidden state to the next stage. The output of the LSTM layer is fed into a layer that plays the role of mapping the extracted features to the output space. Finally, the last layer is a Dense with two neurons that predicts two output values of the model.

3.2 Research Population

The statistical population of the research to test the research hypotheses is also the companies listed on the Tehran Stock Exchange. The systematic elimination method was used to select the sample. For this purpose, a company was selected as the final research sample that had all the following characteristics. Also, the research period was considered from 2016 to the end of 2023. Also, to measure some of the research variables, due to the emphasis on five-year fluctuations, information from companies in the years 2011 to 2015 was needed. Finally, after applying the considered conditions, 105 companies were determined as the final sample of the study. Also, to measure some of the research variables, due to the emphasis on five-year fluctuations, information on companies from 2011 to 2015 was needed.

4 Research Hypotheses

In order to comment on the effect of corporate tax liability on tax planning, the following two hypotheses have been tested:

Hypothesis 1: Corporate tax liability has a negative and significant effect on tax avoidance.

Hypothesis 2: Corporate tax liability has a negative and significant effect on tax risk.

4.1 Variables and Research Model

In the following, the research variables are explained first, and then the hypothesis testing models are stated.

4.1.1 Dependent Variables

Tax planning is considered as a dependent variable in this study. Given the different dimensions of tax planning, tax avoidance and tax risk have been used in the present study as indicators of tax planning. The following describes how to operationally measure these two variables.

Tax avoidance (Tax.Avo): In the present study, following the research of Handuyo et al. [58] the effective tax rate has been used to measure the amount of tax avoidance carried out by companies. The effective tax rate indicates the amount of tax that is deducted and paid from profits. Therefore, a high effective tax rate indicates less tax avoidance by the company.

$$\text{Tax Avoid} = 1 - \text{ETR}.$$

The effective tax rate (ETR) is calculated from the following equation.

$$\text{ETR}_{i,t} = \frac{\text{Tax.Expense}_{i,t}}{\text{Pre Tax Income}_{i,t}}.$$

Tax Risk: In the present study, following Gunter et al. [28], 5-year fluctuations in the effective cash tax rate are used as an indicator of tax risk, which is measured as follows:

$$\text{CETR Volatility}_{i,t} = \text{STDEV}\left(\text{CETR}_{i,t-4} + \text{CETR}_{i,t-3} + \text{CETR}_{i,t-2} + \text{CETR}_{i,t-1} + \text{CETR}_{i,t}\right).$$

4.2 Independent Variables

The independent variable in the present study is corporate tax liability, the method of measuring which is explained below.

Corporate Tax Liability (CTR): In the present study, corporate tax liability, following the model of many studies conducted in Iran who have used the text mining approach in measuring such variables, has been determined by using the method of content analysis of financial statements, the board of directors' report to the general meeting of shareholders, and explanatory notes accompanying the financial statements, and the corporate tax liability score of each company in each year. For this purpose, by examining the aforementioned sources, the disclosure of the aforementioned items was assigned the number one to the disclosed items and the number zero to the undisclosed items. Then, the total value of corporate tax liability was determined through the model proposed in this study.

Basic themes of corporate tax liability: As stated in the research method, after interviewing experts and conducting statistical analyses, the basic themes of corporate tax liability have been extracted. Therefore, based on the determined indicators, the score of the basic themes of corporate tax responsibility will be determined. In other words, the more concepts related to the basic themes are disclosed in the company's reports, the higher the score of the basic themes of corporate tax responsibility will be.

Organizing themes of corporate tax responsibility: As stated in the research method, after interviewing experts and conducting statistical analyses, the organizing themes of corporate tax responsibility have been extracted. Therefore, based on the determined indicators, the score of the organizing themes of corporate tax responsibility will be determined. In other words, the more concepts related to the organizing themes are disclosed in the company's reports, the higher the score of the organizing themes of corporate tax responsibility will be.

Comprehensive themes of corporate tax responsibility: As stated in the research method, after interviewing experts and conducting statistical analyses, the comprehensive themes of corporate tax responsibility have been extracted. Therefore, based on the determined indicators, the score of the comprehensive themes of corporate tax responsibility will be determined. In other words, the more concepts related to the overarching themes are disclosed in the company's reports, the higher the score of the overarching themes of corporate tax responsibility.

To quantify the corporate tax responsibility variable, first, considering that this variable has been indexed by the quantitative department and 4 overarching themes were used to identify corporate tax responsibility, in this study, the researcher first scored based on the organizing themes based on the data related to the companies' financial statements. In this way, if one of the organizing themes was observed in the financial statement, code 1 was recorded for the company under study, otherwise code 0 was recorded. Also, in order to strengthen the reliability of this method, another researcher was used for scoring. If more than 70 percent of the indicators under study in a company had code 1, the company was given a score of 1 (tax responsibility) and otherwise 0 (tax irresponsibility or non-compliance). After examining the scores based on Cohen's Kappa coefficient index, the value of this index was calculated as 0.69 in two surveys conducted for companies by two researchers, which indicates the reliability of the two researchers' scoring.

4.2.1 Control variables

1. According to prior research findings, factors influencing corporate tax planning are categorized into five main groups, each comprising several subgroups. These variables are controlled for when testing the research models to isolate the effects of primary independent variables. The groups and their components are detailed below:

2. **Ownership Structure**

   - **Institutional Ownership (INS)**: Measured as the ratio of shares held by institutional shareholders to the total outstanding common shares at the end of the financial period [59].
   - **State Ownership (SOE)**: Measured as the ratio of shares owned by the government or state-affiliated entities to the total outstanding common shares at the end of the financial period [59].
   - **Ownership Concentration (Own Concentration)**: Measured as the ratio of shares held by major shareholders (owning more than 5%) to the total outstanding common shares at the end of the financial period [59].

3. **Board Characteristics**

   - **Board Size (B.Size)**: Equals the number of board members at the end of the period under review [60].
   - **Board Independence (B.Ind)**: Equals the ratio of non-executive (independent) board members to the total number of board members [60].
   - **Board Gender Diversity (B.Gender)**: Equals the ratio of female board members to the total number of board members at the end of the period under review [60].
   - **CEO Role Duality (Duality)**: A dummy variable taking the value of 1 if the CEO also serves as chairman or vice chairman of the board, and 0 otherwise [60].

4. **Audit Quality**

   - **Auditor Size (Au.Size)**: A dummy variable taking the value of 1 if the company's financial statements were audited by a large audit firm (typically a Big 4 or equivalent) during the period under review, and 0 otherwise [61].

- **Auditor Tenure (Au.Tenure)**: Equals the number of consecutive years the audit firm has been engaged to audit the company's financial statements [60].
- **Audit Committee Size (AC.Size)**: Equals the number of members on the company's audit committee [61].
- **Audit Committee Independence (AC.Ind)**: Equals the ratio of independent (non-executive) members on the audit committee to the total number of committee members [61].

5. **Company Characteristics**

- **Company Size (Size)**: Measured as the natural logarithm of the book value of total assets at the end of the financial period [62].
- **Leverage (Lev)**: Equals the ratio of total debt to total assets at the end of the financial period [63].
- **Return on Assets (ROA)**: Equals the ratio of net income to the book value of total assets at the end of the financial period [63].
- **Asset Tangibility (Tang)**: Equals the ratio of fixed (tangible) assets to total assets at the end of the financial period [64].

5 Political Connections

Political Connections (Pol.Con): Equals the ratio of the number of members present on the company's board of directors who represent the government or government-affiliated entities to the total number of members of the company's board of directors at the end of the period under review [23].

Research Models

To test the research hypotheses, linear regression models were used as follows:

The first research hypothesis will be tested using model (5.1):

Model (5.1)

$$\begin{aligned}\text{Tax.Avo}_{i,t} =&\beta_0 + \beta_1 CTR_{i,t} + \beta_2 \text{INS}_{i,t} + \beta_3 \text{SOE}_{i,t} + \beta_4 \text{Own}_{i,t} + \beta_5 \text{B.Size}_{i,t} + \beta_6 \text{B.Ind}_{i,t} \\ &+ \beta_7 \text{B.Gen}_{i,t} + \beta_8 \text{Duality}_{i,t} + \beta_9 \text{Au.Size}_{i,t} + \beta_{10} \text{Au.Tenure}_{i,t} + \beta_{11} \text{AC.Size}_{i,t} \\ &+ \beta_{12} \text{AC.Ind}_{i,t} + \beta_{13} \text{Size}_{i,t} + \beta_{14} \text{Lev}_{i,t} + \beta_{15} \text{ROA}_{i,t} + \beta_{16} \text{Tang}_{i,t} + \beta_{17} \text{Pol.Con}_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (5.1)$$

The second research hypothesis will be tested using model (5.2):

Model (5.2)

$$\begin{aligned}\text{Tax.Risk}_{i,t} =&\beta_0 + \beta_1 \text{CTR}_{i,t} + \beta_2 \text{INS}_{i,t} + \beta_3 \text{SOE}_{i,t} + \beta_4 \text{Own}_{i,t} + \beta_5 \text{B.Size}_{i,t} + \beta_6 \text{B.Ind}_{i,t} \\ &+ \beta_7 \text{B.Gen}_{i,t} + \beta_8 \text{Duality}_{i,t} + \beta_9 \text{Au.Size}_{i,t} + \beta_{10} \text{Au.Tenure}_{i,t} + \beta_{11} \text{AC.Size}_{i,t} \\ &+ \beta_{12} \text{AC.Ind}_{i,t} + \beta_{13} \text{Size}_{i,t} + \beta_{14} \text{Lev}_{i,t} + \beta_{15} \end{aligned} \quad (5.2)$$

6 Descriptive Findings

Firstly, regarding corporate tax liability, considering that this variable was indexed by the quantitative section and 4 comprehensive themes were used to identify corporate tax liability, in this study, the researcher first scored based on the data related to the financial statements of the companies. In this way, if one of the organizing themes was observed in the financial statement, code 1 was recorded, otherwise code 0 was recorded for the company under study. Also, in order to strengthen the reliability of this method, another researcher was used for scoring. If more than 70 percent of the indicators under study in a company had code 1, the company was given a score of 1 (tax liability) and otherwise 0 (tax irresponsibility or non-compliance). After examining the scores based on the Cohen's Kappa coefficient index, the value of this index was calculated as 0.69 in two studies conducted for the companies by two researchers, which indicates the reliability of the scoring of the two researchers. A sample company review in this regard is presented in the form of a checklist in Table 1:

Table 1: Company Scoring Checklist (Sample)

CTR Indicators	Coder 1 for company comid001	Coder 1 for company comid001
Publication of Effective Tax Rate (ETR)	0	0
Relationship of tax paid to net profit	1	1
Payment of tax at the place of actual economic activity	1	1
Negligible difference between book tax and paid tax	0	0
Consistency of tax rate in different years	1	1
Transparency in the place and amount of tax payment	1	1
Legitimate and targeted use of tax exemptions	1	1
Avoidance of artificial structures to reduce taxes	1	1
Non-involvement in tax claims resulting from legal abuse	0	0
Existence of a policy document complying with the spirit of the tax law	1	1
Public disclosure of the company's tax policy	1	1
Transparent participation in tax policymaking	0	0
Provision of profit, income, tax and employee information	1	1
Disclosure of tax policy in annual reports	1	1
Transparent disclosure of tax incentives and exemptions	1	1
Company's overall score based on CTR	1 (73% approval)	1 (73% approval)

Also, regarding the data where the difference between the first and second place was large (inability to determine the final score), scoring was done with a third researcher for that company, and the average of the three researchers' opinions was determined as the company's final score in this section.

In this continuation of the section, the characteristics of the variables under study are described based on descriptive indicators. These characteristics are presented in the following table:

Table 2: Description of the characteristics of the continuous variables of the research

Variable	**Mean**	**Median**	**SD**	**Min**	**Max**
Tax.Avo	0.310	0.298	0.327	-0.231	0.882
Tax.Risk	0.114	0.115	0.030	0.020	0.201
INS	20.192	15.251	12.877	2.351	25.474
SOE	0.245	0.100	0.240	0.000	0.800
Own	0.578	0.590	0.198	0.200	0.901
B.Size	5.021	5.000	1.436	5.000	7.000
B.Ind	0.443	0.342	0.218	0.200	1.000
B.Gen	0.064	0.000	0.090	0.000	0.400
Au.Tenure	2.995	3.000	2.330	0.000	8.000
AC.Size	3.957	3.000	0.822	3.000	5.000
AC.Ind	0.518	0.451	0.183	0.200	1.000
Size	15.564	15.559	2.676	11.045	2.175
Lev	0.550	0.411	1.081	0.333	1.937
ROA	0.119	0.051	0.206	-0.124	0.568
Tang	0.436	0.430	0.203	0.102	0.801
Pol.Con	0.043	0.000	0.065	0.000	0.180

Table 3: Descriptive statistics of discrete research variables

Variable	**1**	**0**
CTR	0.28	0.72
Duality	0.69	0.31
Au.Size	0.65	0.35

Corporate tax liability is a dummy variable with a frequency of 238 and is observed in 28% of the sample (identified as 1), while in most companies, corporate tax liability is low at 72%.

Regarding tax avoidance, the mean is 0.310 and the median is 0.298. This closeness between the mean and median indicates that the distribution of this variable is somewhat normal, although its minimum is (-0.231) indicating some specific cases with negative levels of tax avoidance. The tax risk variable also has a relatively low mean of 0.114 and a standard deviation of 0.030, indicating a tight distribution, which indicates the relative stability of this indicator among companies. Among the control variables, the institutional ownership variable, with a mean of 190.20 and a standard deviation of 871.12, is one of the variables that has a significant range and dispersion. This variable indicates

the level of institutional ownership in companies. The government ownership variable also shows that some companies have high government ownership with a mean of 0.245 and a maximum of 0.810. In general, the descriptive statistics presented show significant dispersion in some variables, and this diversity provides a suitable basis for predictive and causal analyses.

6.1 Fitting the research models

To implement the LSTM neural network to predict the dependent variables, the normalized data that had previously been scaled between 0 and 1 using MinMaxScaler were entered and loaded into the Python software environment. Then, by sorting the data based on companyid and year, the temporal order of each company's information was preserved. This temporal order is critical for time series models such as LSTM, because such models require the exact order of data over time to learn patterns. The result of this step is a sorted and normalized dataframe that is ready to enter the next process, which is to extract the model inputs and outputs. Then, by accurately identifying the input and output variables of the model, the data structure for the LSTM model is specified. The input variables include all the factors that the model needs to predict, namely the independent variable of corporate tax liability and all the control variables that affect tax behavior. The output variables are the two main indicators of the research, namely tax avoidance and tax risk, which the model is supposed to learn and predict. Unnecessary columns such as companyid and year were discarded at this stage, as they are used only for data sorting and should not be entered into the model. Based on the implementation of this step in the Python software environment, the following were extracted:

- X_all: includes 842 rows (8 years × number of companies) and 17 input features (CTR + control variables)
- Y_all: includes the same 842 rows with 2 dependent variables (Tax.Avo and Tax.Risk)

6.2 Constructing time series for LSTM

In this step, a time series of 17 features was constructed for each listed company that had complete 8-year data (1395 to 1402). Then, the value of the dependent variables in the eighth year (2023) was selected as the output of the model. This structure allows the LSTM model to learn the trend of changes in previous years and predict the two variables Tax. Tax avoidance and tax risk in the final year.

Data division into training and testing + LSTM model design

In this stage, the data was divided into two parts: training and testing, so that the model could be trained on one part and evaluated on the other. Then, using Keras, an LSTM model was designed that first analyzes the sequences and finally predicts two values of tax avoidance and tax risk simultaneously. The main metric of the researcher at this stage is the mean absolute error (MAE), which shows the accuracy of the model. Accordingly, 50 epochs were executed to train the model, an example of these epochs is presented in the following figure:

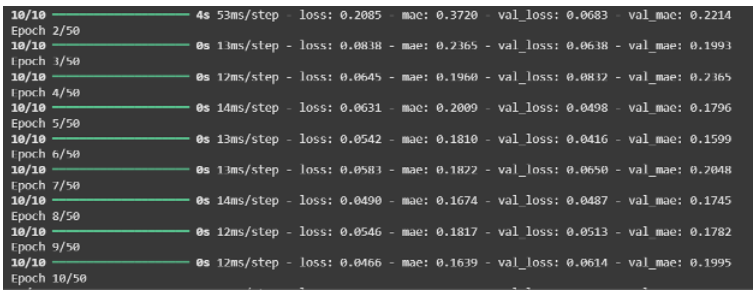


Figure 1: Model epochs in the testing phase in the Python software environment

After running and training the model, the main indicators were performed to evaluate the accuracy of the model in predicting the dependent variables by the independent and control variables. The results of these studies are presented below:

The above graph shows the trend of changes in the Training Loss and Validation Loss during 50 training periods of the LSTM model. As can be seen, the training error has decreased continuously and has a downward trend, indicating proper learning of the model. In contrast, the validation error has significant fluctuations and although it has decreased in some points, it does not have a uniform trend in line with training. This behavior can be a sign of the beginning of overfitting in the model, especially from around epoch 30 onwards when the distance between the two curves increases.

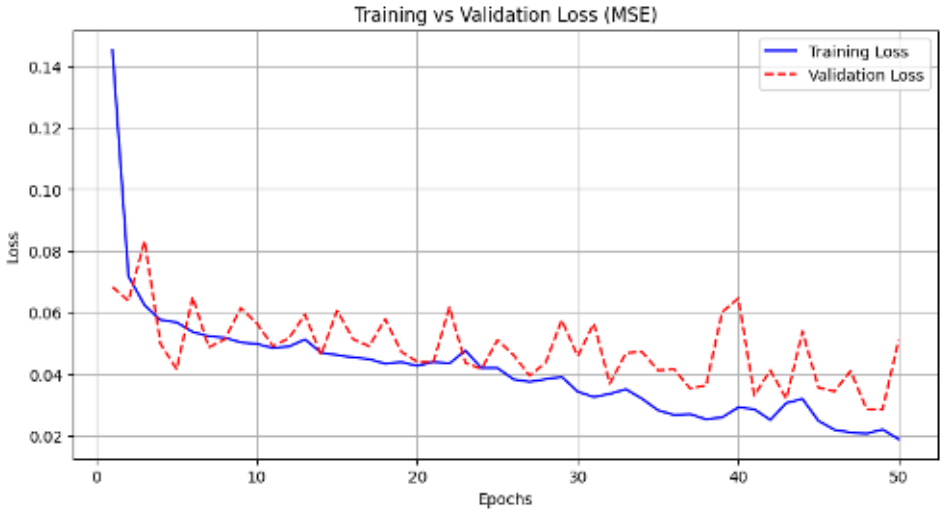


Figure 2: Training vs. Testing Graph (MSE Index)

In general, the model has learned well, but to increase stability and accuracy on new data, it is recommended to use techniques such as Dropout or reduce the complexity of the model.

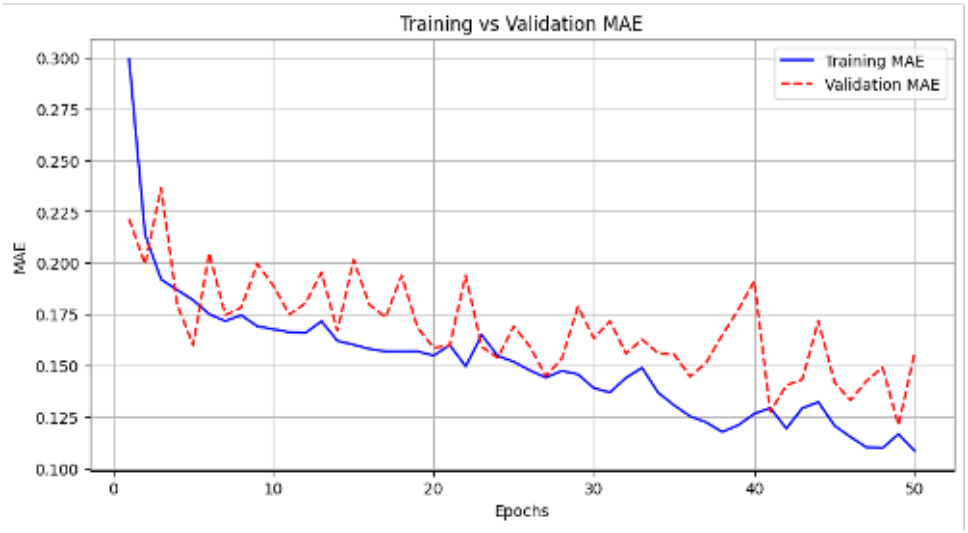


Figure 3: Training vs. Testing (MAE Index)

Figure 3 shows the trend of changes in the mean absolute error (MAE) in the training and validation of the LSTM model. Initially, both curves have relatively high values, but as the number of epochs increases, the training MAE decreases continuously, indicating the successful learning of the model from the training data. In contrast, the validation MAE, despite high fluctuations, has a relatively decreasing trend overall, but from about epoch 25 onwards, the difference between the two curves increases. This can be an indication of the loss of model performance on new data (overfitting). Overall, the model has good accuracy, but to prevent high fluctuations in validation, methods such as EarlyStopping, Regularization or Dropout can be used.

6.3 Using Dropout Technique in LSTM to Increase Model Stability

Dropout is a regularization technique in neural networks that is used to prevent overfitting. In this method, during each training step, a portion of the model neurons are randomly deactivated. This prevents the network from relying too much on a specific number of neurons and instead learns patterns and relationships in a more general and generalizable way. Dropout is usually applied in the hidden layers of the model and is one of the most widely used methods to reduce overfitting due to its simplicity and high efficiency.

In the present study, due to the limited data volume (only 105 companies with 8 years of information), the initial LSTM model without Dropout faced the problem of overfitting. The training plots showed that the model achieved good accuracy on the training data, but had high fluctuations and higher errors on the validation data. This means that the model was retaining specific features of the training data instead of learning general patterns. To mitigate this problem, a Dropout layer with a rate of 0.3 was used to force the model to use different neural pathways and learn more stably. For example, in the model optimized with Dropout, the mean absolute error (MAE) on the test data did not decrease, but the model behavior became much more stable. The error plots showed that the distance between the training and validation errors decreased and the model fluctuations on the validation data became more controlled. This means that the model was able to learn the relationships between the independent and control variables (such as CTR, INS, B.Ind, etc.) with the two dependent variables (Tax.Avo and Tax.Risk) in a more generalizable and accurate way. As a result, Dropout in this study not only maintained the training accuracy, but also improved the stability of the model on real data. The following are the graphs examined after implementing this technique:

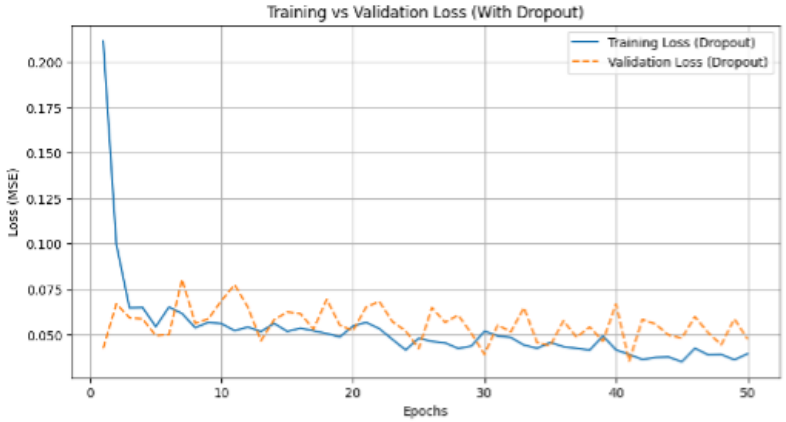


Figure 4: MSE plot after Dropout

The above plot shows the trend of mean square error (MSE) changes in the LSTM model with the Dropout layer. As can be seen, the training loss decreased rapidly and reached relative stability around epoch 10 onwards. In contrast, the validation loss, despite minor fluctuations, remained in a stable range and close to the training line, indicating a significant reduction in overfitting compared to the model without Dropout. This plot shows that the use of Dropout has not only made the model learn more effectively, but also provided more stable performance on unseen data.

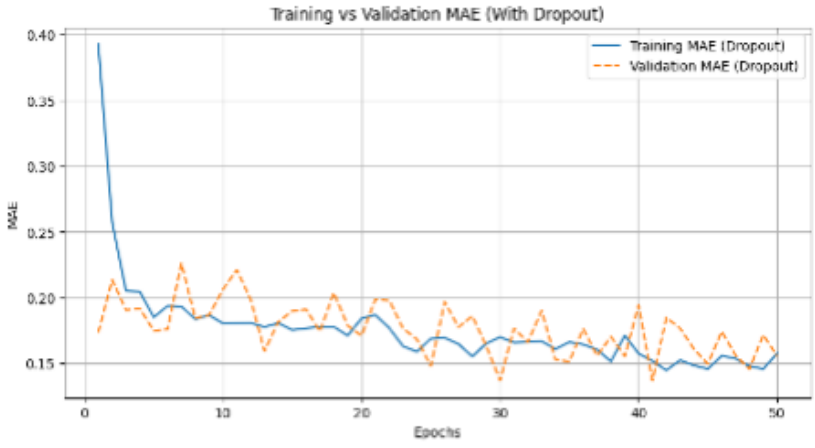


Figure 5: MAE plot after Dropout

The above plot shows the trend of changes in the mean absolute error (MAE) of the LSTM model with Dropout. As can be seen, the training error (Training MAE) decreased rapidly and reached relative stability after about epoch 10. Although the validation error (Validation MAE) also fluctuated, these fluctuations remained within a reasonable range and continued with a limited distance from the training line. This behavior indicates that the model with Dropout was able to create a good balance between accurate learning in training and generalizability to new data. In

general, the MAE plot confirms the positive effect of Dropout in controlling overfitting and improving the stability of the model.

6.4 Examining the coefficient of determination and the root of square error of the model

In this section, the coefficient of determination and the root of square error of the model were used to separate the results based on the dependent variables. The results of this study are presented in the following table:

Table 4: Coefficient of Determination and Root Mean Square Error of the Model

Dependent Variable	RMSE	R^2
Tax.Avo	0.268	0.057
Tax.Risk	0.149	0.320

The results show that the LSTM model with Dropout performed better in predicting the tax risk variable than tax avoidance. The RMSE value for tax risk is about 0.149, which is a relatively low and acceptable error compared to its value (normalized in the range of 0 to 1). Also, the coefficient of determination R^2 for tax risk is equal to 0.320, which indicates that about 32% of the changes in this variable can be explained by the model.

In contrast, the R^2 for tax avoidance is only about 0.06, which indicates that the model could not predict the changes in this variable well. Also, the higher RMSE value (0.268) for tax avoidance indicates a lower accuracy of the model in predicting this indicator. These results may be due to the higher complexity or less dynamicity of tax avoidance behavior compared to tax risk, or that the available control variables have less impact on the accurate prediction of tax avoidance.

6.5 Assessing the importance of permutations for the tax risk variable

In this section, due to the high level of the coefficient of determination of the tax risk variable, the effects of control and independent variables on this variable are examined. In this section, the permutation importance method is used:

Table 5: Permutation importance for the tax risk variable

Variable	Importance
CTR	0.0087758
Au.Size	0.008262762
B.Ind	0.0020488
Lev	0.001009871
Pol.Con	0.000527661
ROA	0.00042407
Au.Tenure	0.00024533
INS	0.000243676
AC.Size	0.0000657
Size	−0.000191519
Duality	−0.000219864
Tang	−0.000323359
AC.Ind	−0.00042429
Own	−0.000508675
B.Gen	−0.000726288
B.Size	−0.001691637
SOE	−0.001830965

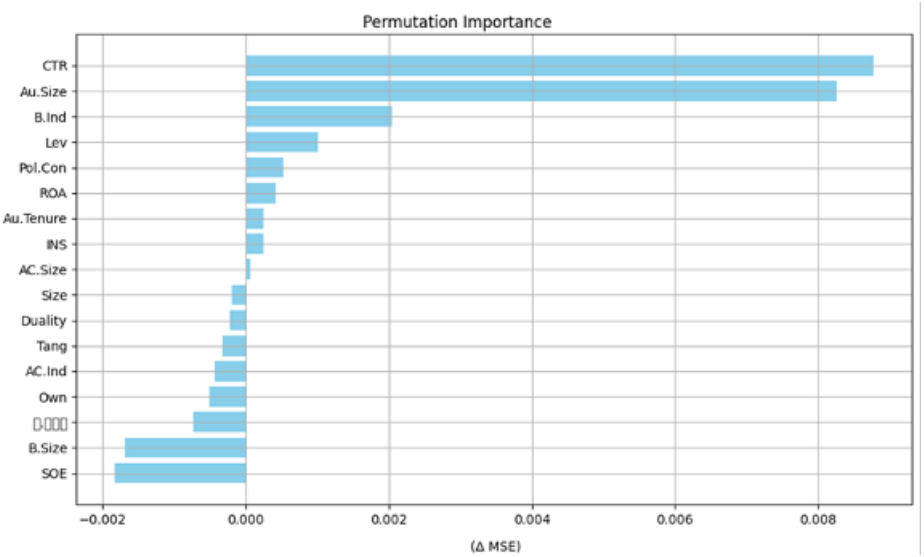


Figure 6: Permutation Importance Assessment for Tax Risk Variable

Based on the results of the Permutation Importance analysis, the input variables of the LSTM model are ranked based on their impact on predicting the dependent variable of tax risk. At the top of this table is the corporate tax liability variable, which, with a significant difference compared to other variables, has caused the largest increase in model error after random disturbance in its values. This finding clearly emphasizes that corporate tax liability plays a pivotal role in explaining changes in tax risk and its impact on companies' tax behavior is of great importance. The audit firm size variable is also ranked second, which shows that characteristics related to supervisory and audit institutions are also very effective in predicting the level of tax risk. Other variables such as board independence, financial leverage, and political connections also have a positive impact on the accuracy of the model and indicate the role of control, financial, and institutional structures in determining tax risk.

On the other side of the table, variables such as government ownership, board size, ownership concentration, and tangible assets appear with negative coefficients, meaning that random permutations of their values have not even led to a relative improvement in model performance or have had a significant impact on reducing accuracy. These results indicate that some structural and ownership variables may have played a lesser role in the current model or may even be associated with noise. Another important point is the limited impact of gender variables and some audit committee variables such as audit committee size and independence, which indicates that in the context of tax risk, these factors have not played a significant role within the framework of the available data. Overall, the results of this analysis indicate that corporate tax liability, regulatory dimensions, and financial structures play a more effective role in explaining companies' tax risk than other factors and should be given special attention in future analyses.

6.6 Assessing the importance of permutations for the tax avoidance variable

In this section, due to the low level of the coefficient of determination of the tax avoidance variable, the effects of control and independent variables on this variable have been examined. In this section, the permutation importance method has been used:

The results of the Permutation Importance analysis for the dependent variable of tax avoidance show that the corporate tax liability variable is by far the most important factor in predicting this indicator. The decrease in the model's performance after creating a random disturbance in the values of corporate tax liability is more than twice that of other features, which indicates its direct and strong effect on tax avoidance. In other words, companies that behave more responsibly towards taxes show a significantly lower level of tax avoidance, and the model was able to identify this relationship well and learn effectively based on it. After corporate tax liability, the variables of political connections, board size, and audit firm size are ranked next in importance. These findings indicate that corporate governance structures and institutional connections also affect their tax avoidance behavior.

In the middle ranks of the table, variables such as institutional ownership, audit committee independence, and profitability are found, which have a moderating and complementary role in the model's performance. The positive effect of these variables, although weaker than the main factors, indicates that the financial structure and supervisory mechanisms of companies also play a role in the company's tax decision-making process. On the other hand, some

Table 6: Permutation importance for the tax avoidance variable

Variable	Importance
CTR	0.016005218
Pol.Con	0.006455578
B.Size	0.006080594
Au.Size	0.005627273
INS	0.003585034
AC.Ind	0.001912341
ROA	0.000971376
AC.Size	0.000756625
Duality	0.000299824
B.Gen	0.0000324
Size	−0.00074229
Lev	−0.00140852
SOE	−0.001741402
Tang	−0.002054325
Own	−0.002794136
Au.Tenure	−0.002939805
B.Ind	−0.002973085

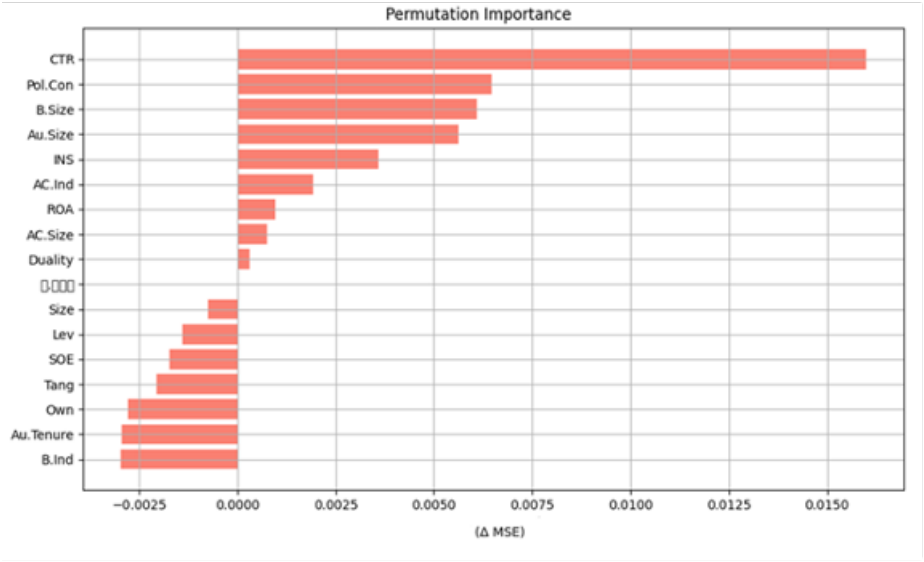


Figure 7: Permutation Importance Assessment for Tax Avoidance Variable

characteristics such as board independence, auditor tenure, and ownership have negative significance values, meaning that their random substitution not only did not lead to a decrease in model accuracy, but in some cases, it slightly improved model performance. This indicates that either these variables are noisy or do not add specific information to the model in combination with other characteristics. Also, the variables of tangible assets, government ownership, and financial leverage are also at the bottom of the table, which could be due to their limited impact in the specific data framework of the present study. In general, the results show that tax avoidance in listed companies is particularly affected by tax responsibility, institutional conditions and governance structures, and other financial and ownership factors have played a lesser role in explaining it.

6.7 Part Two Causality Analysis with Panel Regression

In this section, causality analysis has been used to examine the causal relationships between independent and control variables with the dependent variable in order to examine the research hypotheses. Initially, the Hausman test was used to examine the use of fixed or random effects in the studies. It is worth noting that all these steps have been implemented in the form of Python software:

The results of the Hausman test for the two dependent variables of the study showed that the selection of the type of panel model should be done according to the specific characteristics of each variable. For the tax avoidance variable, the fixed effects model was found to be more appropriate, because the R-squared (Within) was relatively high

Table 7: Hausman test

Attribute / Dependent Variable	**Tax.Avo**	**Tax.Risk**
Model	Fixed Effects	Random Effects
R-squared (Within)	0.3251	0.1754
R-squared (Overall)	-0.3361	0.2217
CTR	-0.3874 ($t = -3.89$)	-0.1098 ($t = -2.19$)
Significance	Yes ($p < 0.01$)	Yes ($p < 0.05$)
Interpretation of Tax Liability Effect	Increase in tax liability → decrease in tax avoidance	Growth in CTR → decrease in tax risk
Final Interpretation	Strong negative relationship between corporate tax liability and tax avoidance; fixed effects model better captures intra-firm differences.	Negative and significant relationship between corporate tax liability and tax risk; random effects model better explains inter-firm differences.

(0.3251) and intra-firm differences had a significant impact on the results. The coefficient of the independent variable corporate tax liability in this model is negative and highly significant ($\beta = -0.3874,\ t = -3.89$), which indicates that as the level of tax liability of companies increases, the amount of tax avoidance decreases significantly. These findings emphasize that intra-organizational behaviors in companies in the field of tax avoidance are more important than differences between companies.

In contrast, for the tax risk variable, the random effects model performed better; Especially considering the positive and relatively high R-squared (Overall) (0.2217) and the statistical significance of the CTR coefficient ($\beta = -0.1098,\ t = -2.19$). This result suggests that increasing corporate tax liability leads to a reduction in tax risk, but here differences between companies play a more key role and the intra-company nature of the effects is less significant. In other words, the structural and institutional characteristics of companies (such as size, type of ownership or their position in the industry) can be effective in the level of tax risk. In summary, the selection of different models for the two dependent variables with careful reliance on statistical evidence demonstrates the methodological rigor of the analysis and emphasizes the validity of the results.

Investigating the relationship between the corporate tax liability variable and tax avoidance

This analysis uses panel data regression with fixed effects. The results of this study, which was conducted in Python software with the presence of all control variables and the independent variables of corporate tax liability and risk avoidance, are presented in the following table:

Table 8: Relationship between the variable of corporate tax liability and tax avoidance

Variable	**Coef. Tax.Avo**	**t-stat Tax.Avo**	**p-value Tax.Avo**	**Coef. Tax.Risk**	**t-stat Tax.Risk**	**p-value Tax.Risk**
CTR	-0.3874	-3.89	0.0001	-0.0905	-1.78	0.0754
INS	-0.0537	-0.68	0.4968	-0.0113	-0.28	0.778
SOE	-0.1256	-2.49	0.0131	0.0095	0.37	0.712
Own	0.0929	1.76	0.0793	-0.0006	-0.02	0.981
B.Size	-0.0245	-0.96	0.3382	-0.0032	-0.24	0.811
B.Ind	0.0136	0.19	0.8522	-0.0328	-0.88	0.38
B.Gen	0.0283	0.68	0.4956	0.0002	0.01	0.991
Dual	0.0322	0.49	0.6241	-0.0443	-1.32	0.186
Au.Size	-0.0174	-0.43	0.6645	0.0243	1.18	0.237
Au.Tenure	0.0051	0.16	0.873	0.0364	2.21	0.027
AC.Size	0.0029	0.13	0.8963	0.0204	1.82	0.069
AC.Ind	0.0112	0.14	0.8881	-0.0006	-0.01	0.989
Size	-0.0029	-0.09	0.9251	0.0195	1.22	0.223
Lev	-0.0525	-1.17	0.2421	0.0032	0.14	0.889
ROA	0.0231	0.28	0.7773	-0.0531	-1.27	0.203
Tang	-0.0221	-0.70	0.4835	-0.0188	-1.17	0.242
Pol.Con	0.0247	0.96	0.3356	-0.0253	-1.93	0.054

Based on the results of the panel regression with fixed effects for the dependent variable of tax avoidance, the main hypothesis of the study can be confirmed that there is a negative and significant relationship between corporate tax liability and tax avoidance. The coefficient of corporate tax liability is (-0.3874) and its significance level is 0.0001, which indicates a strong and significant effect of this variable at a high confidence level. This means that with the increase in the responsibility of companies towards paying taxes, the amount of tax avoidance decreases significantly.

Other variables such as state ownership also have a negative and significant effect, which indicates that state-owned companies also have a lower tendency to avoid taxes. On the other hand, the model has an R-squared (Within) of 0.3251 and a significant F-statistic of 0.0000, which indicates that the model is statistically appropriate and the variables included have been able to explain an acceptable share of the variance of tax avoidance. Overall, the findings clearly support the acceptance of the first hypothesis of the study and introduce tax responsibility as one of the key factors in reducing tax avoidance behaviors of companies.

6.8 Investigating the relationship between the variable of corporate tax responsibility and tax risk

This analysis uses panel data regression with random effects. The results of this study, which was examined in the form of Python software with the presence of all control variables and the independent variables of corporate tax responsibility and tax risk, are presented in the following table:

Table 9: Relationship between corporate tax liability variable and tax risk

ariable	**Coef. Tax.Avo**	**t-stat Tax.Avo**	**p-value Tax.Avo**	**t-stat Tax.Risk**	**p-value Tax.Risk**
CTR	0.5679	11.96	0.0000	11.96	0.0000
INS	-0.1098	-2.19	0.0287	-2.19	0.0287
SOE	-0.0084	-0.21	0.8349	-0.21	0.8349
Own	0.0158	0.61	0.5426	0.61	0.5426
B.Size	-0.0053	-0.19	0.8466	-0.19	0.8466
B.Ind	-0.0084	-0.64	0.5215	-0.64	0.5215
B.Gen	-0.0446	-1.21	0.2257	-1.21	0.2257
Dual	-0.0002	-0.01	0.9919	-0.01	0.9919
Au.Size	-0.0526	-1.67	0.0951	-1.67	0.0951
Au.Tenure	0.0393	1.98	0.0481	1.98	0.0481
AC.Size	0.0428	2.62	0.0089	2.62	0.0089
AC.Ind	0.0172	1.53	0.1276	1.53	0.1276
Size	0.0135	0.33	0.7424	0.33	0.7424
Lev	0.0202	1.26	0.2067	1.26	0.2067
ROA	0.0073	0.32	0.7510	0.32	0.7510
Tang	-0.0371	-0.89	0.3752	-0.89	0.3752
Pol.Con	-0.0111	-0.69	0.4913	-0.69	0.4913

Model Summary:
R-squared (Overall): 0.2217
F-statistic: 11.841
F-statistic p-value: 0.0000

According to the results of the panel regression model with random effects for the dependent variable of tax risk, the second hypothesis of the study can also be confirmed. The coefficient of the corporate tax liability variable is (-0.1098) and the value of the t-statistic is (-2.19) and the significance level is 0.0287. These results indicate the existence of a significant and negative relationship between corporate tax liability and tax risk at a 95% confidence level. In other words, as the level of corporate tax liability increases, the probability of high-risk tax behaviors decreases. In addition, control variables such as auditor tenure and audit firm size also have a positive and significant effect on tax risk, which could indicate the complexity in the way these regulatory bodies relate to corporate tax behaviors. The model has an adjusted coefficient of determination equal to 0.2217 and a highly significant F-statistic (0.0000), which indicates the appropriate fit of the model and the effective role of the variables included in explaining the variance of tax risk. Therefore, the second hypothesis of the study is also confirmed and it can be concluded that increasing corporate tax liability is one of the factors deterring tax risk in listed companies.

7 Discussion and Conclusion

In recent years, corporate tax liability as one of the important dimensions of corporate social responsibility has received special attention from researchers, policymakers and regulatory agencies. Given the increasing complexity of tax systems and the emergence of complex tax avoidance methods, examining the relationship between the level of corporate tax liability and their avoidance behaviors has gained great importance. The main objective of the present study was to examine this relationship within the framework of real data of listed companies and using the panel regression method with fixed effects; A model that allows for the analysis of intra-firm changes and is very suitable for multi-year combined data.

The findings obtained from this model show that there is a negative and significant relationship between corporate tax responsibility and tax avoidance. In other words, companies that have a higher commitment to fulfilling their tax responsibility are less likely to engage in tax avoidance behaviors. This result is an empirical confirmation of the claim that tax responsibility can play a deterrent role against tax-reducing practices and push companies to more transparent and sustainable paths in paying taxes. Also, variables such as state ownership have been effective in reducing tax avoidance, which is probably due to greater supervision of state-owned companies, transparency of their performance, and higher social sensitivity to the tax behaviors of these companies. In addition, the quality of the model has been assessed as statistically acceptable. The model fit indices show that the variables included were able to explain a significant portion of the changes in tax avoidance behavior of firms. In particular, the explanatory power of the model at the within-firm level (over time for each firm) shows that focusing on behavioral differences over time has provided much more accurate results than simply differences between firms. This highlights the importance of choosing the right model and level of analysis in tax research. In conclusion, it can be said that the findings of this study clearly indicate that the more responsible firms are in paying taxes, the less likely they are to use tax avoidance mechanisms. This relationship is statistically significant and conceptually important and can be a basis for formulating incentive policies and regulations to increase tax transparency and corporate accountability. The results also emphasize the need to strengthen the supervision of companies with specific ownership structures and promote the disclosure of tax policies in order to prevent risky tax behaviors. These findings can be used in the framework of national tax policymaking and as part of the assessment of corporate performance in the field of economic and social sustainability. In this context, studies such a Sarhan [54], Scarpa et al. [55], Pipatnarapong et al. [48], Almutairi and Abdelazim [5], Khorramabadi et al. [37], Rahmani et al. [50], have shown that social responsibility is a factor in reducing tax avoidance. However, there is no similar study to compare the relationship between social responsibility and tax avoidance. On the other hand, the results of the research of Golzar et al. [27] in a view contrary to the principles of the research, indicate a positive relationship between social responsibility and tax avoidance.

In order to continue examining the causal relationships between the main research variables, a panel regression model analysis with random effects was conducted for the dependent variable of tax risk. The purpose of this analysis was to test the second hypothesis of the study, which stated: "Increasing corporate tax liability leads to a decrease in corporate tax risk." Considering the characteristics of the data and the results of the Hausman test, the random effects model was considered appropriate because it is able to better explain the differences between companies. The results obtained from this model showed that there is a negative and significant relationship between the corporate tax liability variable and tax risk. This means that the higher the level of tax liability of companies, the lower the probability of risky tax decisions. This finding is consistent with the theoretical foundations of the study and indicates that companies committed to paying taxes fairly are less likely to engage in ambiguous, aggressive, or dangerous tax activities. Therefore, responsible behavior towards the tax system not only affects the amount of tax paid, but also plays an important role in reducing legal risks, tax disputes, and potential lawsuits. In addition to the main research variable, some control variables also appeared significant in this model. In particular, auditor tenure and audit firm size had a positive and significant relationship with tax risk. This finding could indicate a complex dynamic between supervisory institutions and companies' tax behaviors; meaning that companies may become more bold in making risky tax decisions with increasing influence and longer presence of auditors, or that larger auditors are present in more complex and risky companies. These relationships require more qualitative and in-depth analyses in future research. The statistical model used was also assessed as having a good fit. The overall coefficient of determination and the significant F-statistic indicate that the combination of variables included in the model was able to explain a significant portion of the changes in corporate tax risk. Therefore, it can be concluded that the model is statistically reliable and its findings are scientifically accurate. In conclusion, the findings of this part of the study clearly support the confirmation of the second hypothesis. The results show that increasing corporate tax responsibility plays a deterrent role against tax risk. This result can be a basis for tax policymakers, auditors, and financial managers to implement a fairer tax system at the level of economic enterprises and reduce risky behavior in the field of tax by strengthening responsibility. In this context, Wu [63], Salami et al. [52], in relatively similar studies, have emphasized the impact of social responsibility on tax risk, although so far, no similar study has been presented in Iran or abroad that has examined the relationship between corporate tax responsibility and tax risk.

Based on the results of this study, the following practical suggestions can be made to the companies under study:

- Design and implement a formal tax liability policy in companies: Given the negative and significant impact of corporate tax liability on tax avoidance and risk, it is recommended that listed companies develop and implement a transparent and formal tax policy. This policy should include ethical principles in paying taxes, a commitment to complying with the spirit of the law and avoiding aggressive or suspicious planning. Publishing this policy in annual reports not only increases transparency and shareholder trust, but can also act as a tool to prevent tax

lawsuits and reduce legal risks.

- Strengthen the oversight and independence of governance and audit structures: The results of the study showed that variables such as the auditor's tenure and the size of the audit firm play a role in the formation of companies' tax risk. Therefore, it is recommended that listed companies review the process of selecting auditors, and in particular, strengthen the independence of internal oversight bodies such as the audit committee, to provide a basis for timely identification and prevention of risky tax behaviors. Selecting reputable but rotating audit firms and limiting long-term relationships with a specific auditor can prevent the formation of risky dependencies and increase transparency in tax behaviors.

- Key tax information should be reflected in internal audit and audit committee reports and made available to the board of directors and shareholders. Issues such as the difference between book and paid taxes, the extent of utilization of exemptions, ongoing tax cases, and estimates of potential penalties should be reviewed in periodic audit committee meetings and disclosed if necessary. This measure will increase internal oversight of the company's tax performance and provide a basis for more effective accountability.

- It is essential for companies to establish a mechanism within their corporate governance framework to monitor and stabilize tax rates over successive years. Extreme fluctuations in tax rates can be a sign of irresponsible and volatile strategies. Establishing an internal committee to review tax trends and develop sustainable policies in this area can lead to a long-term commitment by the company to a fair approach to paying taxes.

- Listed companies should disclose the use of tax incentives and exemptions in an accurate and measurable manner. Although companies are entitled to benefit from legal incentives, concealing or using them irregularly can lead to weakening transparency and increasing reputational risk. Companies committed to tax responsibility should not only report these exemptions, but also specify the purposes for which they are used (such as investment, research and development, or job creation).

- Companies should publish detailed information on profits, revenues, taxes paid and number of employees by operating unit, in addition to financial statements and board reports. This will allow investors, regulators and other stakeholders to better assess the ratio of actual economic activity to taxes paid and to assess the company's tax treatment fairly and transparently.

- Companies should disclose their tax policy in a structured manner as part of the company's annual or sustainability reports. This policy could include the company's key principles regarding taxes, how decisions are made on incentives, the role of the audit committee in overseeing tax performance and tax risk management mechanisms. Including this section in official documents not only demonstrates the company's commitment to transparency, but also provides a valuable benchmark for comparison among companies.

- Finally, companies should establish internal mechanisms for assessing and continuously monitoring their tax treatment. This mechanism can operate in the form of a tax risk assessment unit or a sub-committee of the audit committee, and its task is to continuously review the compliance of policies with the law, monitor changes in the tax environment, and continuously review strategies. The existence of such an institution institutionalizes tax responsibility in the company's executive and supervisory structure.

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