

Research Article

Corporate Tax Aggressiveness and Earnings Management in Emerging Markets: The Moderating Effect of Board Independence in Iran

Running title: Tax Aggressiveness and Board Independence in Iran

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ABSTRACT

PURPOSE: This study examines whether board independence affects corporate tax aggressiveness and whether it moderates the relationship between earnings management and tax aggressiveness in Iran, an emerging market in which listed firms benefit from statutory tax incentives.

DESIGN/METHODOLOGY/APPROACH: Using 1,000 firm-year observations from 125 non-financial firms listed on the Tehran Stock Exchange and Farabourse over 2013–2022, we estimate multivariate panel regressions with year fixed effects and heteroskedasticity-consistent standard errors, controlling for industry-level effective tax rates that reflect statutory exemptions. Tax aggressiveness is measured by book–tax differences, earnings management by discretionary accruals from the modified Jones model, and board independence by an indicator of an above-average proportion of independent directors. The models are re-estimated for large versus small firms and for firms with high versus low free float.

FINDINGS: Board independence is positively and significantly associated with tax aggressiveness in the full sample and among large firms. Earnings management is positively related to tax aggressiveness, and this relationship is stronger in firms with more independent boards. The direct effect of board independence is significant only in firms with below-average free float, where ownership is more concentrated, whereas its moderating effect is significant in firms with above-average free float.

RESEARCH IMPLICATIONS: In emerging markets with concentrated ownership and generous tax incentives, formally independent boards do not necessarily curb aggressive tax planning. Tax authorities and governance regulators should therefore look beyond board composition when assessing corporate tax risk.

ORIGINALITY/VALUE: The study provides new evidence from Iran, an under-researched setting in which statutory tax rates differ between listed and non-listed firms, and shows how board structure conditions the nexus between earnings management and tax aggressiveness.

RESEARCH HIGHLIGHTS

- Board independence is linked to higher corporate tax aggressiveness in Iran.
- Independent boards strengthen the earnings management–tax aggressiveness link.
- The direct board effect appears only in firms with concentrated ownership.



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1. Introduction

Investment in capital markets is vital for economic growth and is widely regarded as an indicator of a country's economic development. Many firms access financial markets to raise funds, and governments have introduced special incentives, such as tax exemptions, to encourage firms to participate in these markets (Clark *et al.*, 2007; Klemm, 2010; Klemm & Van Parys, 2012; Lent, 1967; Twesige & Gasheja, 2019).

In the wake of international financial scandals, numerous studies have examined the effectiveness of tax regulations, and aggressive corporate tax policy has attracted particular attention in recent years (Boussaidi & Hamed-Sidhom, 2021; Francis *et al.*, 2022; Shamil *et al.*, 2024).

The taxation of listed firms is an important topic in the tax literature because of its implications for current and future corporate performance. In several countries, listed firms enjoy tax exemptions and therefore pay less tax than unlisted firms (Amidu *et al.*, 2019; Francis *et al.*, 2022). To benefit further from such exemptions, firms may adopt aggressive tax policies (ATPs), that is, tax planning strategies designed to reduce their tax liability (Chen *et al.*, 2010). ATPs have become an integral part of the business environment in many countries because they shape decisions aimed at increasing profits and investment. Prior research has examined how corporate governance (CG) structures affect tax avoidance in order to identify mechanisms that could restrain it (Armstrong *et al.*, 2015; Asnaashari *et al.*, 2024). However, few studies have directly examined how CG mechanisms—particularly board composition—affect corporate tax policy. In emerging markets such as Iran, a growing body of evidence links CG dimensions to aggressive tax planning (Asnaashari *et al.*, 2024; Ebrahimi & Ahmadi, 2016; Moghaddam, 2017). This evidence indicates that, in environments characterized by weaker institutional frameworks and distinct regulatory pressures (Azizkhani *et al.*, 2018), board structures play a critical role in either constraining or facilitating tax avoidance. Nevertheless, this literature focuses largely on direct relationships, leaving a gap in our understanding of how specific governance mechanisms interact with firm-level characteristics to influence tax aggressiveness. Among the many features of CG, board independence is regarded as one of the most effective means of reducing internal conflicts and agency problems (Al-Absy, 2022; Crifo & Roudaut, 2022; Li *et al.*, 2025).

Previous studies have focused mainly on the economic and governance implications of aggressive tax policies in developed markets (Dyreng *et al.*, 2008; Kovermann & Velte, 2019; Salhi *et al.*, 2020; Wang *et al.*, 2020). We extend this line of research to the distinctive dynamics of emerging markets, which pose particular challenges and opportunities for firms—including tax regulation—and are often shaped by evolving regulatory environments and rapidly changing economic conditions. In this context, we examine how the presence and proportion of independent directors affect the development and implementation of tax strategies. Although the existing literature offers valuable insights into the economic consequences of tax avoidance, few studies explicitly consider the complexities of emerging markets and their dynamic tax environments. Our study addresses this gap by examining the interplay between board composition, earnings management, and tax strategy while accounting for the regulatory challenges and opportunities specific to these markets. We also extend the discussion of the governance role of independent directors beyond earnings management to their potential influence on corporate reputation and stakeholder relations. This perspective sheds light on ATPs in an environment where tax law itself encourages managers to reduce the tax burden.

Board structures are also important for organizational performance in dynamic environments; a successful firm therefore needs an effective board (Zaroki & Taherian, 2016). Desai and Dharmapala (2006) argue that self-interested managers may create complex corporate structures to reduce taxes while diverting corporate resources for personal gain, and they also ask how tax policy should respond to CG mechanisms. Subsequent research has further examined the link between CG and tax avoidance (Cabello *et al.*, 2019).

Considering Iran's distinctive institutional environment as a developing country—comparable in some respects to Thailand, Tunisia, and Ghana—this study explores the impact of board composition on tax policy and finds that board independence affects corporate tax policy. By examining the nuanced role of independent directors in tax policymaking within an evolving tax regulatory landscape, we provide evidence relevant to the design and oversight of corporate tax strategies.

This study contributes to the literature in three ways. First, it provides evidence from Iran, an under-researched emerging market in which statutory tax rates differ between listed and non-listed firms. Second, it shows that board independence conditions the relationship between earnings management and tax aggressiveness, rather than examining direct effects alone. Third, it shows that the governance effect of the board differs with firm size and ownership concentration. The remainder of the paper is organized as follows. Section 2 reviews the theoretical background, prior evidence, and institutional setting and develops the hypotheses; Section 3 describes the data, variables, and models; Section 4 reports the results; Section 5 discusses the findings; and Section 6 concludes.

2. Theoretical Background and Literature Review

2.1. Conceptual and theoretical foundations

Aggressive tax planning encompasses a range of strategies used to minimize a firm's tax liability (Hanlon & Heitzman, 2010). Conventional theory holds that tax avoidance transfers wealth from the government to shareholders. Whereas legal tax avoidance reduces state revenue, highly aggressive strategies can blur the line between legal avoidance and illegal evasion, potentially depriving the economy of vital tax funds. Aggressive tax strategies also create agency conflicts because managers and shareholders often differ in their tolerance of tax-related uncertainty. Shareholders generally expect management to act on their behalf by maximizing after-tax profits, which includes minimizing the firm's tax burden. However, agency theory suggests that the separation of ownership and control may lead to tax decisions that reflect managerial rather than shareholder interests. Specifically, Desai and Dharmapala (2006) argue that managers may exploit complex tax-avoidance structures to conceal self-dealing and divert firm resources for personal gain.

From a traditional agency perspective, the presence of outside directors may signal the effectiveness of board monitoring (Harford *et al.*, 2008), and the primary function of an independent board is to monitor managerial activities (Fama & Jensen, 1983). Prior research has examined the effect of board monitoring on financial reporting, corporate fraud, and tax policy (Lanis *et al.*, 2017). Boards, which guide the firm toward strategic goals such as limiting the tax burden, play an important role in allocating resources and increasing shareholder wealth, thereby improving firm performance. Effective tax management can reduce the tax burden and thus improve business performance (Minnick & Noga, 2010). However, tax planning is fraught with uncertainty and can encourage opportunistic managerial behavior. According to agency theory, opportunistic management imposes agency costs on shareholders, such as the time and expense of monitoring managers to ensure that they act in shareholders' interests (Jensen & Meckling, 1976). Directors' interests have therefore become a central topic in the CG literature because of the potential for opportunism associated with financial manipulation, and board structure is regarded as an important mechanism for limiting opportunistic managerial behavior (Hooghiemstra *et al.*, 2019). Evidence also indicates that firms with higher insider ownership pay more tax and avoid less, although different managerial ownership structures are associated with varying degrees of tax avoidance (Cabello *et al.*, 2019). This view is consistent with Zeng (2014), who finds that state ownership mitigates, whereas ownership concentration increases, tax-motivated earnings management around a tax rate reduction. Because corruption, collusion, and nepotism remain problems in many settings, board composition can have a significant effect on tax policy.

In Iran, the corporate income tax rate for unlisted firms is 25% of taxable profit under the Direct Taxes Act, whereas firms listed on the stock exchanges receive preferential reductions of 10% or 5%, depending on the market on which they are listed; this lowers the statutory rate from 25% to 22.5% and 23.75%, respectively. These exemptions were formally enacted by Parliament. Pursuant to Article 143 of the Direct Taxes Act, a 10% reduction applies to the income tax derived from the sale of goods on a commodity exchange and to the income tax of firms whose shares are traded on the main market of the stock exchange or on the over-the-counter market, and a 5% reduction applies to firms whose shares are traded on other markets. These reductions apply from the time of listing until the firm is delisted with the approval of the Securities and Exchange Organization (SEO).

2.2. Empirical evidence and unresolved gap

This section reviews research on aggressive tax policies in developed countries, such as the United States, and in developing countries, including Iran, Thailand, Tunisia, and Ghana. This evidence suggests that board structure may condition the relationship between tax strategy and earnings management.

A substantial stream of literature examines the intersection of financial reporting, managerial characteristics, and corporate tax aggressiveness (CTA). Prior studies establish that financial reporting aggressiveness and tax aggressiveness are often positively associated (Desai & Dharmapala, 2006; Frank *et al.*, 2009). Building on this evidence, Fernandes (2017) examined the relationship across 15 European countries and found that firms engaging in aggressive financial reporting also tend to be tax aggressive. Similarly, Beuselinck and Deloof (2014) showed that Belgian firms actively manage earnings in response to tax incentives and that the use of discretionary accruals is closely tied to the firm's marginal tax rate. Beyond the European context, managerial traits and firm-specific complexities also shape tax strategies. Among U.S. companies, Francis *et al.* (2022) found that CTA is negatively associated with managerial ability; they argue that highly able managers avoid highly aggressive tax strategies because of the associated reputational and career risks, a relationship that is particularly pronounced for firms with greater investment opportunities and heightened reputational concerns. Overall, this evidence indicates that CTA is not an isolated financial decision but a complex outcome shaped by reporting incentives, managerial ability, and the broader governance environment.

In emerging markets, Marzuki and Al-Amin (2021) find that board ownership increases tax aggressiveness in Thailand. Amidu *et al.* (2019) show that firms in Ghana manipulate earnings to avoid taxes, and their evidence suggests that non-financial firms engage in such manipulation more than financial firms. In Tunisia, Dridi and Boubaker (2015) document that the gap between pre-tax accounting income and declared taxable income reflects managerial discretion when earnings management and tax management are carried out simultaneously; they report a significant association between this gap, discretionary accruals, and real activities manipulation. In the same region, Boussaidi and Hamed-Sidhom (2021) examined how board characteristics and the nature of ownership affect corporate tax aggressiveness; their results indicate that the presence of women on the board, CEO duality, managerial ownership, and institutional ownership significantly influence the level of tax aggressiveness.

Studies in Asia report mixed results regarding the effect of board independence on CTA. For example, Dhamara and Violita (2017) and Aburajab *et al.* (2019) found no significant association between board independence and tax aggressiveness. By contrast, Shamil *et al.* (2024) report that the effect of board characteristics, including independence, on tax aggressiveness in Sri Lanka is inconsistent across effective tax rate measures, suggesting that boards play only a limited role in curbing tax aggressiveness. Marzuki and Al-Amin (2021) also found that board ownership has a positive effect on CTA, indicating that higher board ownership increases tax aggressiveness.

In Iran, Agha Alikhani *et al.* (2020) examined whether board independence affects the relationship between dividend reductions and corporate tax avoidance on the Tehran Stock Exchange (TSE) and found that independent directors are unable to influence tax management. Ebrahimi and Ahmadi (2016) report a positive relationship between the effective tax rate and earnings management. Amiri *et al.* (2021) found that the proportion of non-executive directors has a significant effect on tax avoidance among TSE firms. Kashanipour *et al.* (2020) showed that political connections have a positive and significant effect on CTA, whereas board independence and institutional ownership have a negative effect, and that these governance mechanisms weaken the association between political connections and CTA. Examining book-tax conformity and earnings management in Iran, Moghaddam (2017) reports a positive relationship between the two. Asnaashari *et al.* (2024) document a significant positive association between tax avoidance and organizational capital among TSE firms and an influential role of CEO overconfidence in this relationship. In a related line of research, Kazemiloum *et al.* (2025) show that CEO power shapes reclassification-based earnings management across corporate life-cycle stages, underscoring the importance of governance in constraining managerial reporting discretion in Iranian firms. Taken together, these findings point to a gap between corporate governance practice and the objectives of the tax system.

2.3. Hypothesis development

Empirical evidence on the relationship between board structure and corporate tax aggressiveness remains mixed. Using Australian data, Lanis and Richardson (2011) find that a higher proportion of outside directors significantly reduces the likelihood of tax aggressiveness, whereas Minnick and Noga (2010), using U.S. data, find no significant association between outside directors and tax aggressiveness. This divergence can be explained by the dual and sometimes conflicting roles of independent directors. On the one hand, if directors view tax aggressiveness as a high-risk activity that threatens their reputational capital and invites regulatory scrutiny, they will constrain such strategies. On the other hand, if they view tax planning strictly through the lens of shareholder wealth maximization, they may encourage aggressive strategies to increase after-tax cash flows. Based on this discussion, we formulate the first hypothesis:

H1. Firms with a higher proportion of independent directors on their boards exhibit lower levels of corporate tax aggressiveness.

Recent research shows that firms use earnings management and tax planning strategies jointly to mitigate rising tax burdens (Assidi *et al.*, 2022; Irawan *et al.*, 2020; Tanko, 2025), and that board-level governance mechanisms can weaken the link between the two (Assidi *et al.*, 2022). Accordingly, we formulate the second hypothesis:

H2. Board independence significantly moderates the association between earnings management and corporate tax aggressiveness.

3. Data and Methodology

3.1. Research design and analytical framework

This study uses multivariate regression analysis to test the hypotheses. The unit of analysis is the firm-year, and the models are estimated in a panel data framework with fiscal-year fixed effects. Because panel data are frequently susceptible to heteroskedasticity, which can bias standard errors and invalidate statistical inference, we use the HC3 heteroskedasticity-consistent covariance matrix estimator to compute robust standard errors (MacKinnon & White, 1985; White, 1980). The HC3 estimator is preferred because it has superior finite-sample properties and yields more accurate hypothesis tests than earlier robust estimators (Long & Ervin, 2000).

3.2. Population, sample, data sources, and study period

Our sample comprises non-financial companies listed on the TSE and Farabourse (the Iranian over-the-counter market) over the period 2013–2022. After removing observations with missing information, the final sample consists of 1,000 firm-year observations for 125 firms. All data were obtained from the Comprehensive Information System of Publishers (CODAL), the official disclosure platform for Iranian listed firms. To examine heterogeneity, the observations are also analyzed separately for large and small firms, classified by total assets relative to the yearly sample average.

3.3. Variables, constructs, and measurement

Corporate tax aggressiveness. Several measures of tax aggressiveness have been proposed in prior studies (e.g., Chen *et al.*, 2010; Manzon & Plesko, 2001). We measure tax aggressiveness (TAXAGR) using book–tax differences (BTD) scaled by total assets. BTD is computed as the difference between accounting profit before tax and taxable profit, where taxable profit is estimated by dividing the firm’s tax expense by the applicable statutory tax rate (Tang, 2015). In this calculation, we take into account the statutory tax exemptions for firms listed on the TSE and Farabourse and their effect on the applicable tax rate. In particular, under Article 6 of the Law of the Sixth Five-Year Economic, Social, and Cultural Development Plan of Iran, the applicable rate for listed firms is approximately 20% if their free float is at least 20%, and 22.5% otherwise. This measure therefore reflects ATPs through the divergence between book income and taxable income.

We use BTD as the primary proxy for corporate tax aggressiveness because of its methodological and theoretical properties. First, compared with the GAAP effective tax rate (ETR), BTD avoids the severe measurement error associated with the “denominator problem”: when pre-tax income is close to zero or negative, the GAAP ETR yields

highly volatile, extreme values that do not reflect actual tax planning (Dyreng *et al.*, 2008; Hanlon & Heitzman, 2010). By scaling the divergence between book and taxable income by total assets, BTD provides a more stable and continuous measure. Second, relative to the cash ETR, BTD is empirically more robust. The cash ETR is highly sensitive to year-to-year fluctuations in cash flows and the timing of tax payments, whereas BTD captures the cumulative effect of both permanent and temporary book–tax differences, reflecting deliberate, long-term managerial decisions that create a divergence between reported accounting profit and taxable income (Yoon *et al.*, 2021). Consequently, BTD is less susceptible to short-term cash-flow distortions and provides a more reliable estimate of a firm’s underlying propensity for tax avoidance (Hanlon & Heitzman, 2010; Yoon *et al.*, 2021). Third, from a theoretical perspective, BTD aligns directly with the fundamental nature of tax avoidance: the deliberate management of two distinct sets of books (Desai, 2003). By calculating expected tax using the statutory tax rate rather than firms’ actual effective rates, the BTD measure filters out noise created by firm-specific structural tax attributes, such as loss carryforwards or tax credits (Frank *et al.*, 2009). By isolating discretionary tax aggressiveness and avoiding the statistical pitfalls of ETR-based measures, BTD serves as a precise and robust proxy for managerial tax avoidance in this study.

Board independence. In line with prior studies (Boussaidi & Hamed-Sidhom, 2021; Richardson *et al.*, 2016), we measure board structure—an important element of the CG framework in Iran—by board independence, that is, the percentage of independent directors on the board. To capture potential non-linear threshold effects and to mitigate the influence of extreme values in the continuous measure, we construct a dichotomous variable, BOARD, which equals 1 if the percentage of independent directors is strictly greater than the yearly sample average, and 0 otherwise. This split approach is widely used in the CG and accounting literature to partition firms into high and low governance regimes, and it facilitates subsample comparisons and robustness checks (Cheng & Warfield, 2005; Faleye, 2007; Klein, 2002).

Earnings management. We measure earnings management (EM) using discretionary accruals estimated with the modified Jones model, which Dechow *et al.* (1995) identify as the most powerful of the models they evaluate for detecting earnings management. Total accruals are regressed on the inverse of total assets, the change in revenue adjusted for the change in receivables, and gross property, plant, and equipment (Equation 3 in Section 3.4). The model is estimated for each industry, based on the CODAL industry classification.

Control variables. Following prior studies, we control for firm size (SIZE), the natural logarithm of total assets at the end of fiscal year t ; financial leverage (LEV), the ratio of total liabilities to total assets; the market-to-book ratio (MTB), the ratio of the market value to the book value of equity; return on assets (ROA), the ratio of net profit to total assets; firm age (AGE), the natural logarithm of the number of years since listing; earnings volatility (STDEARN), the three-year standard deviation of net profit (loss); revenue volatility (STDINCOME), the three-year standard deviation of revenue; and free float (FREEFLOAT), the proportion of the firm’s shares that are freely traded on the capital market. To control for industry-specific tax behavior, we also include the industry-level effective tax rate, calculated after accounting for statutory tax exemptions, and each firm’s categorical eligibility for these exemptions. Table 1 summarizes the definitions of all variables.

Table 1. Variable definitions and measurement

Variable	Role	Operational definition	Data source	Expected sign
TAXAGR	Dependent	Book-tax difference: (pre-tax accounting profit – tax expense ÷ statutory tax rate) ÷ total assets	CODAL	—
BOARD	Main predictor (H1)	1 if the percentage of independent directors exceeds the yearly sample average; 0 otherwise	CODAL	– (H1)
EM	Main predictor	Discretionary accruals from the modified Jones model (Equation 3)	CODAL	+
BOARD × EM	Interaction (H2)	Product of BOARD and EM	—	±
SIZE	Control	Natural logarithm of total assets at the end of year t	CODAL	±
LEV	Control	Total liabilities ÷ total assets	CODAL	±
MTB	Control	Market value of equity ÷ book value of equity	CODAL	±
ROA	Control	Net profit ÷ total assets	CODAL	±
AGE	Control	Natural logarithm of the number of years since listing	CODAL	±
STDEARN	Control	Three-year standard deviation of net profit (loss)	CODAL	±
STDINCOME	Control	Three-year standard deviation of revenue	CODAL	±
FREEFLOAT	Control	Proportion of the firm's shares that are freely traded	CODAL	±

Notes: CODAL = Comprehensive Information System of Publishers. All continuous variables are winsorized at the 1st and 99th percentiles. ± indicates no directional prediction; the expected sign of BOARD reflects H1.

3.4. Model specification and estimation procedure

To test the hypotheses, we estimate two models. Model (1) examines the direct effects of board independence and earnings management on tax aggressiveness (H1):

$$\begin{aligned} \text{TAXAGR}_{i,t} = & \beta_0 + \beta_1 \text{BOARD}_{i,t} + \beta_2 \text{EM}_{i,t} + \beta_3 \text{SIZE}_{i,t} + \beta_4 \text{LEV}_{i,t} \\ & + \beta_5 \text{MTB}_{i,t} + \beta_6 \text{ROA}_{i,t} + \beta_7 \text{AGE}_{i,t} + \beta_8 \text{STDEARN}_{i,t} \\ & + \beta_9 \text{STDINCOME}_{i,t} + \beta_{10} \text{FREEFLOAT}_{i,t} + \lambda_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Model (2) adds the interaction between board independence and earnings management to test whether the board moderates the effect of earnings management on tax aggressiveness (H2):

$$\begin{aligned} \text{TAXAGR}_{i,t} = & \beta_0 + \beta_1 \text{BOARD}_{i,t} + \beta_2 \text{EM}_{i,t} + \beta_3 (\text{BOARD}_{i,t} \times \text{EM}_{i,t}) \\ & + \beta_4 \text{SIZE}_{i,t} + \beta_5 \text{LEV}_{i,t} + \beta_6 \text{MTB}_{i,t} + \beta_7 \text{ROA}_{i,t} + \beta_8 \text{AGE}_{i,t} \\ & + \beta_9 \text{STDEARN}_{i,t} + \beta_{10} \text{STDINCOME}_{i,t} + \beta_{11} \text{FREEFLOAT}_{i,t} + \lambda_t + \varepsilon_{i,t} \end{aligned} \quad (2)$$

where i and t denote firm and year, respectively; TAXAGR is tax aggressiveness; BOARD is the board independence indicator; EM is earnings management; BOARD × EM is their interaction; SIZE, LEV, MTB, ROA, AGE, STDEARN, STDINCOME, and FREEFLOAT are control variables defined in Table 1; λ_t denotes year fixed effects; and $\varepsilon_{i,t}$ is the error term. Standard errors are computed with the HC3 heteroskedasticity-consistent estimator. H1 predicts $\beta_1 < 0$ in Model (1), and H2 is supported if β_3 in Model (2) is statistically significant.

Discretionary accruals are estimated with the modified Jones model (Dechow *et al.*, 1995):

$$\frac{\text{TA}_{i,t}}{A_{i,t}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{i,t}} \right) + \alpha_2 \left(\frac{\Delta \text{REV}_{i,t} - \Delta \text{REC}_{i,t}}{A_{i,t}} \right) + \alpha_3 \left(\frac{\text{PPE}_{i,t}}{A_{i,t}} \right) + \varepsilon_{i,t} \quad (3)$$

where $\text{TA}_{i,t}$ is total accruals for firm i in year t ; $A_{i,t}$ is total assets of firm i at the end of year t ; $\Delta \text{REV}_{i,t}$ is the change in net sales of firm i between years $t - 1$ and t ; $\Delta \text{REC}_{i,t}$ is the change in receivables of firm i between years $t - 1$ and t ; $\text{PPE}_{i,t}$ is gross property, plant, and equipment of firm i in year t ; and $\varepsilon_{i,t}$ is the error term, which measures discretionary accruals (EM).

3.5. Validity, robustness, and reproducibility

Several procedures support the validity of our inferences. First, all continuous variables are winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. Second, standard errors are based on the HC3 estimator, which is robust to heteroskedasticity of unknown form (Long & Ervin, 2000). Third, the Wooldridge test for first-order autocorrelation in panel data confirms the absence of serial correlation in the residuals ($F = 0.019$; $p = 0.890$). Fourth,

variance inflation factors (VIFs) are used to assess multicollinearity (Section 4.1). Finally, we assess the robustness of the results by re-estimating the models for subsamples partitioned by firm size and ownership concentration (free float) and by replacing the dichotomous board independence measure with the continuous percentage of independent directors (Section 4.3).

4. Results

4.1. Descriptive statistics and preliminary analysis

Table 2 reports summary statistics for the research variables. All continuous variables are winsorized at the 1st and 99th percentiles. The correlation matrix (untabulated) does not reveal strong pairwise correlations among the explanatory variables.

Table 2. Descriptive statistics

Variable	N	Mean	Median	SD	Minimum	Maximum	VIF
TAXAGR	1,000	0.078	0.037	0.141	−0.579	0.765	—
EM	1,000	−0.0034	−0.023	0.231	−1.411	1.599	2.45
BOARD	1,000	0.436	0.000	0.496	0.000	1.000	1.09
SIZE	1,000	15.051	14.765	1.649	11.116	21.328	1.73
LEV	1,000	0.536	0.536	0.210	0.031	1.334	2.26
MTB	1,000	4.106	2.873	3.417	−1.539	12.560	2.53
ROA	1,000	0.159	0.127	0.165	−0.540	0.765	3.00
AGE	1,000	2.823	2.944	0.544	0.000	3.989	1.26
STDEARN	1,000	0.078	0.060	0.067	0.000	0.504	1.65
STDINCOME	1,000	0.263	0.181	0.286	0.005	2.650	1.27
FREEFLOAT	1,000	0.305	0.253	0.169	0.060	0.880	1.42

Notes: N = number of firm-year observations; SD = standard deviation; VIF = variance inflation factor, which quantifies the extent to which a predictor is correlated with the other predictors in the model. All continuous variables are winsorized at the 1st and 99th percentiles. Variables are defined in Table 1.

As shown in Table 2, 43.6% of firm-years have board independence above the yearly average. The mean of discretionary accruals (EM) is −0.0034. The mean financial leverage is 0.536, indicating that the sample firms finance approximately 54% of their assets with debt. The mean return on assets of 0.159 indicates how effectively the firms convert their assets into net income. The mean firm size, measured as the natural logarithm of total assets, is 15.051, and the mean market-to-book ratio is 4.106, indicating substantial growth opportunities. The standard deviations of net income (loss) and sales average 0.078 and 0.263, respectively, and the mean free float is 30.5%.

As reported in Table 2, all VIF values are well below the conventional thresholds of 5 and 10, indicating that multicollinearity is not a serious concern (Kim, 2019). Abdoli *et al.* (2013) show that, among large Iranian firms with higher discretionary accruals, the difference between self-declared tax and the tax assessed by the tax authority is larger, and that tax differences between firms arise primarily from the exemptions provided in Articles 132 and 138 of the Direct Taxes Act. They also find that, especially for small firms, the difference between self-declared and assessed tax relates to the disallowance of expenses under Articles 147 and 148 of the Act. Accordingly, we classify observations as large or small firms by comparing their total assets with the yearly sample average; 42.4% of the observations fall into the large-firm category and the remainder into the small-firm category.

4.2. Main findings

Table 3 reports the regression results.

Table 3. Regression results: tax aggressiveness, board independence, and earnings management

Variables	Full sample		Large firms	Small firms
	(1)	(2)	(3)	(4)
EM	0.0716*** (5.94)	0.0457** (2.84)	0.0119 (0.55)	0.0999*** (4.37)
BOARD	0.00988* (1.98)	0.00988* (1.98)	0.0247** (3.06)	0.000874 (0.15)
EM × BOARD		0.0506* (2.42)	0.0604* (2.02)	0.00308 (0.11)
SIZE	0.00738*** (3.89)	0.00725*** (3.83)	0.0103** (3.22)	0.00223 (0.48)
ROA	0.609*** (24.40)	0.608*** (24.39)	0.749*** (19.39)	0.491*** (15.19)
LEV	-0.0157 (-0.93)	-0.0186 (-1.10)	-0.00446 (-0.17)	-0.0119 (-0.55)
MTB	-0.00154 (-1.39)	-0.00141 (-1.28)	0.000213 (0.13)	-0.00328* (-2.18)
AGE	-0.0112* (-2.28)	-0.0111* (-2.28)	-0.0240*** (-3.53)	0.00929 (1.38)
STDEARN	0.171*** (3.76)	0.169*** (3.72)	0.0841 (1.16)	0.134* (2.36)
STDINCOME	-0.0527*** (-5.62)	-0.0527*** (-5.63)	-0.0887*** (-7.53)	-0.000779 (-0.05)
FREEFLOAT	0.0239 (1.43)	0.0203 (1.21)	0.0387 (1.21)	0.0108 (0.57)
Intercept	-0.100** (-2.82)	-0.0958** (-2.69)	-0.117+ (-1.89)	-0.0763 (-1.12)
Year fixed effects	Yes	Yes	Yes	Yes
Observations	1,000	1,000	424	576
R ²	0.721	0.722	0.797	0.643
Adjusted R ²	0.716	0.717	0.787	0.631
F-statistic	149.1	141.8	88.07	55.65
Prob (F-statistic)	< 0.05	< 0.05	< 0.05	< 0.05

Notes: The table reports regressions of tax aggressiveness (TAXAGR) on earnings management (EM) and board independence (BOARD) with year fixed effects. Models (1) and (2) are estimated for the full sample; Models (3) and (4) are estimated for large and small firms, respectively. t-statistics based on HC3 robust standard errors are reported in parentheses. ***, **, *, and + denote significance at $p < 0.001$, $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively. Variables are defined in Table 1.

The adjusted R² of the full-sample models indicates that approximately 72% of the variation in tax aggressiveness is explained by the explanatory variables. Across the four specifications, the adjusted R² ranges from 0.63 to 0.79, which is comparable to values reported in prior studies (Asnaashari *et al.*, 2024; Ebrahimi & Ahmadi, 2016; Tang, 2015). The coefficient on EM is positive and significant for the full sample and for small firms, indicating that earnings management is positively associated with tax aggressiveness. The coefficient on BOARD is also positive and significant in the full sample and among large firms. Because H1 predicts a negative association, H1 is not supported; instead, the evidence indicates that greater board independence is associated with higher tax aggressiveness.

The coefficient on the interaction term (EM × BOARD) is 0.0506 and statistically significant ($p < 0.05$), indicating that board independence moderates the relationship between earnings management and tax aggressiveness; H2 is therefore supported. The decline in the EM coefficient from 0.0716 in the baseline model to 0.0457 in the moderated model reflects the standard decomposition of interaction effects: in Model (2), the EM coefficient (0.0457, $p < 0.01$) represents the conditional effect of earnings management for firms with low board independence (BOARD = 0). For firms with high board independence (BOARD = 1), the total marginal effect of EM on tax aggressiveness rises to 0.0963 (0.0457 + 0.0506). Furthermore, the positive and significant coefficient on BOARD (0.00988, $p < 0.05$)

confirms that independent directors are associated with higher levels of tax aggressiveness. The interaction is also significant among large firms (0.0604, $p < 0.05$) but not among small firms.

4.3. Robustness, sensitivity, and additional analyses

Tax exemptions for publicly traded firms reduce their costs (Klemm, 2010) and may also create opportunities for earnings management; because of this advantage, many firms have sought listing on the capital market. In the CG literature, free float serves as a continuous, inverse proxy for ownership concentration. A lower free float indicates more concentrated ownership, in which controlling insiders hold entrenched power and face less scrutiny from the market, potentially exacerbating Type II agency conflicts between controlling and minority shareholders.

Firms listed on the main market or Farabourse with at least 20% free float at the end of the reporting period are entitled to an additional tax reduction. Under tax law, listed firms are eligible for a 10% reduction in the tax rate, so that the statutory rate for listed firms is 22.5%, and for firms with more than 20% free float it falls to 20%. We therefore re-estimate Model (2) separately for firms whose free float is at or above, and below, the industry average in each year. The results in Table 4 show that earnings management has a significant positive effect on tax aggressiveness in both subsamples. Board independence has a significant direct effect only when the free float is below average—that is, when ownership is more concentrated—whereas the interaction between earnings management and board independence is significant only for firms with above-average free float.

Table 4. Regression results for firms with free float at or above, and below, the industry average in each year

Variables	FREEFLOAT $\geq M$	FREEFLOAT $< M$
EM	0.0498* (2.14)	0.0446* (2.10)
BOARD	-0.00563 (-0.90)	0.0167* (2.31)
EM $\times$ BOARD	0.0656* (2.46)	0.0417 (1.30)
SIZE	-0.00232 (-1.00)	0.0141*** (5.13)
ROA	0.609*** (18.07)	0.605*** (17.02)
LEV	-0.0324+ (-1.67)	-0.0145 (-0.53)
MTB	-0.00313* (-2.28)	-0.000196 (-0.12)
AGE	-0.00724 (-1.14)	-0.00837 (-1.19)
STDEARN	0.0347 (0.60)	0.247*** (3.81)
STDINCOME	-0.0380*** (-3.75)	-0.0538** (-3.18)
FREEFLOAT	-0.0102 (-0.42)	-0.139* (-2.37)
Intercept	0.0702 (1.54)	-0.190*** (-3.65)
Year fixed effects	Yes	Yes
Observations	400	600
R ²	0.802	0.697
Adjusted R ²	0.793	0.688
F-statistic	85.91	74.38
Prob (F-statistic)	< 0.05	< 0.05

Notes: The table reports regressions of tax aggressiveness (TAXAGR) on earnings management (EM) and board independence (BOARD) for firms with high and low free float. M denotes the industry-average free float in each year. t -statistics based on HC3 robust standard errors are reported in parentheses. ***, **, *, and + denote significance at $p < 0.001$, $p < 0.01$, $p < 0.05$, and $p < 0.10$, respectively. Variables are defined in Table 1.

To further ensure the robustness of our findings, we re-estimate the main models using the continuous percentage of independent directors as an alternative measure of board independence. The untabulated results are qualitatively and statistically consistent with the primary findings, confirming that our conclusions are not driven by the specific operationalization of board independence.

5. Discussion

5.1. Interpretation relative to theory and prior evidence

This study explores the effect of board independence on corporate tax aggressiveness and on the relationship between earnings management and firms' tax policies. Aggressive corporate tax planning may pose a challenge for tax authorities, and the interests of shareholders and managers regarding tax avoidance may diverge. Shareholders generally expect managers to act on their behalf and to maximize profits, including by minimizing the tax burden. From an agency perspective, however, the separation of ownership and control may result in tax decisions that reflect managers' rather than shareholders' interests. Independent directors are expected to strengthen the board's capacity to monitor management, which motivated our first hypothesis that board independence reduces tax aggressiveness. Contrary to this expectation, we find a positive association between board independence and tax aggressiveness in the full sample and among large firms. This result contrasts with evidence that outside directors constrain tax aggressiveness in developed markets (Lanis & Richardson, 2011) and with the negative effect of board independence reported for Iranian firms by Kashanipour *et al.* (2020), but it is consistent with Iranian evidence that independent directors are unable to restrain tax management (Agha Alikhani *et al.*, 2020) and with the significant effect of non-executive directors on tax avoidance reported by Amiri *et al.* (2021).

Consistent with our second hypothesis, the positive and significant coefficient on $EM \times BOARD$ indicates that board independence moderates—and in fact amplifies—the effect of earnings management on tax aggressiveness. Rather than restraining aggressive tax planning, independent directors in this setting appear to be associated with its intensification. These findings show that board composition and governance structures shape firms' tax strategies, particularly within the distinctive institutional context of emerging markets.

5.2. Theoretical and methodological contributions

According to agency theory, opportunistic managerial behavior imposes costs on shareholders because of the need for continuous monitoring to ensure that managers act in shareholders' interests. Concerns about directors' vested interests have therefore attracted considerable attention in CG research, especially regarding the potential for opportunistic manipulation of financial reporting. In developing countries, where CG structures are less firmly established, this problem manifests itself differently. Our evidence contributes to this literature by showing that, in such settings, formal board independence does not necessarily translate into effective monitoring of tax-related decisions and may even accompany more aggressive tax reporting. Methodologically, the study highlights the value of examining the interaction between earnings management and governance, rather than direct effects alone, and of partitioning the sample by firm size and ownership concentration.

5.3. Managerial, regulatory, investment, and policy implications

The findings have several implications. For tax authorities, the positive association between board independence and tax aggressiveness suggests that the presence of independent directors should not be treated as a signal of low tax risk when selecting firms for audit; firms with high discretionary accruals warrant closer scrutiny regardless of board composition. For capital market regulators such as the SEO, the results suggest that strengthening the substantive independence of directors—for example, through their appointment process and accountability—may be more important than increasing their number. For policymakers, the interaction between tax incentives for listed firms and governance outcomes indicates that the design of exemptions linked to listing and free float should consider their potential effect on tax planning incentives. These implications should be interpreted in light of the study's observational design and its focus on Iranian listed firms.

6. Conclusion

This study shows that board independence is positively associated with corporate tax aggressiveness and strengthens the positive relationship between earnings management and tax aggressiveness among Iranian listed firms. This counterintuitive finding challenges mainstream agency theory but reflects the institutional realities of emerging markets such as Iran. We interpret it through three complementary theoretical lenses. First, independent directors are often appointed by controlling insiders or the government, which limits their substantive monitoring capacity and may reduce their presence on the board to a symbolic function. Second, drawing on the managerial entrenchment and regulatory capture perspectives, directors in environments with concentrated ownership may be captured by dominant insiders, facilitating aggressive tax strategies that disproportionately benefit controlling shareholders. Third, from a resource dependence perspective, independent directors may act as strategic advisors who use their specialized financial and tax expertise to design sophisticated tax-avoidance strategies. Together, these mechanisms suggest that CG operates differently in emerging economies and underscore the need to move beyond universal agency assumptions toward context-sensitive governance theories.

6.1. Limitations and future research

An important limitation of this study pertains to the tax incentive structure governing listed firms in the Iranian capital market. Under Articles 141 and 143 of Iran's Direct Taxes Act, firms listed on the TSE and Farabourse are granted preferential corporate income tax reductions (10% and 5%, respectively). Although the use of listed firms is a methodological strength of this study—providing access to audited, transparent, and publicly available financial data—this preferential regime shapes the tax planning incentives and behavior of the sampled firms in ways that differ fundamentally from those of unlisted companies. Specifically, the availability of statutory exemptions may amplify the observed relationship between board governance and tax aggressiveness, because managers and directors operate in a fiscal environment in which aggressive tax planning yields different marginal benefits than in markets without such incentives. In addition, the observational design does not permit causal inference, because board composition may itself be endogenous to firms' tax strategies.

Future research could examine alternative monitoring mechanisms in small firms, such as family ownership, CEO duality, insider ownership, or informal governance structures, to determine whether they substitute for formal board independence. Although this study focuses on board independence, the quality and diversity of the board may yield different results; future studies could investigate board gender diversity, directors with specific tax or financial expertise, or dedicated ESG or tax committees. Finally, because the study is set in a single emerging market with specific regulatory and economic conditions (e.g., economic constraints), the generalizability of the findings is uncertain. Future research could conduct cross-country comparisons between emerging markets (e.g., Turkey and the MENA region) and developed economies.

Declarations and Transparency Statements

Author contributions (CRediT)

Conceptualization, V.O.; methodology, V.O.; formal analysis, V.O.; visualization, V.O.; data curation, M.S.; software, M.S.; validation, M.S.; project administration, P.D.; resources, P.D.; writing—original draft, P.D.; writing—review and editing, P.D. and M.S. All authors approved the final manuscript.

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Conflict of interest

The authors declare no competing interests.

Ethics approval

Not applicable. The study uses publicly available firm-level secondary data and does not involve human participants or animals.

Informed consent

Not applicable.

Data availability

The data used in this study were obtained from CODAL (<https://www.codal.ir>), a publicly accessible disclosure system for Iranian listed firms. The compiled dataset is available from the corresponding author upon reasonable request.

Code availability

The code used for the analyses is available from the corresponding author upon reasonable request.

Use of generative AI and AI-assisted technologies

During the preparation of this manuscript, an AI-assisted tool was used for language editing, formatting to the journal template, and checking the bibliographic details of the references. The authors reviewed and verified all content and take full responsibility for the accuracy, originality, and integrity of the manuscript.

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