

Tax Management and Financial Sustainability in Chinese High-Tech Enterprises: ARDL Evidence from BATH Firms

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Abstract: This study examines the relationship between tax management and financial sustainability in Chinese High and New-Technology Enterprises (HNTes), focusing on leading BATH firms (Baidu, Alibaba, Tencent, and Huawei). A quantitative approach was adopted using purposive sampling of 55 financial statements from 2008 to 2023. Tax management was measured through the cash effective tax rate (CETR), while financial sustainability was evaluated using three DuPont-based indicators: net profit margin (NPM), asset turnover (AT), and equity multiplier (EM). To capture both short- and long-term dynamics, the Autoregressive Distributed Lag (ARDL) bounds testing approach was applied. The findings confirm the presence of long-run cointegration among the variables and reveal that NPM, AT, and intangible assets (INTGO) exert a significant positive effect on CETR over the long run, whereas amortization plays a notable role in the short run. Beyond financial mechanics, these findings demonstrate that firms with stronger profitability, efficient resource utilization, and innovation capacity are more capable of adopting responsible tax strategies. Such practices reinforce corporate governance, stabilize public revenues, and foster stakeholder trust, thereby linking firm-level performance with societal welfare. This study contributes by positioning tax management as a strategic mechanism through which high-tech enterprises align financial resilience with broader sustainability goals.

Keywords: ARDL model, China, DuPont analysis, Effective Tax Rate, financial sustainability, high-tech enterprises, tax management.

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INTRODUCTION

China's high and new technology sector has been widely acknowledged as a key driver of national economic development, covering fields such as advanced materials, ICT, aerospace, biotechnology, renewable energy, laser, and automation technologies (Zhang, 2019). To encourage innovation and strengthen this sector, the government established the High and New Technology Enterprises (HNTE) program, which provides certified firms with preferential tax treatment through a reduced corporate income tax rate. Although the program functions as a tax incentive, it differs from the common policy tools applied in the United States and the European Union, where instruments such as accelerated R&D depreciation, tax credits, or deductions for R&D



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activities, as well as exemptions for research personnel, are more frequently used (Dai & Wang, 2019). Under the 2007 Corporate Income Tax Law, enterprises certified as HNTes in China are entitled to a corporate income tax rate of 15%, compared to the statutory 25% (Tian, Yu, Chen, & Ye, 2020). This preferential tax framework enables HNTes to adopt various tax management strategies that can significantly influence their financial sustainability. This preferential tax framework enables HNTes to adopt various tax management strategies that can significantly influence their financial sustainability. In this context, tax management is understood as the set of legally acceptable practices designed to reduce taxable income and corporate tax liabilities. Prior studies have emphasized that effective tax management is not only a financial tool but also a managerial responsibility, given its direct implications for corporate performance and shareholder value (Hakim & Omri, 2015).

Tax management, defined as legally permissible actions to reduce taxable income, is recognized as a critical managerial tool (Guenther, Njoroge, & Williams, 2020; Hakim & Omri, 2015). Scholes and Wolfson (1992, as cited in Shevlin (2020) emphasize that effective tax management requires a holistic approach, integrating all stakeholders, all types of taxes, and all costs into business strategy. While numerous studies have examined the relationship between tax management and financial performance, fewer explicitly link tax management to financial sustainability, which encompasses long-term liquidity, risk mitigation, and continuous growth (Bowman, 2011; Kakati & Roy, 2021; Osazefua Imhanzenobe, 2020; Putra, Wiagustini, Ramantha, & Sedana, 2022; Ur Rahman et al., 2020).

Empirical studies consistently show that effective tax management enhances firm stability and optimizes resource allocation. For example, Tackie, Agyei, Bawuah, Adela, and Bossman (2022) find that firms with lower effective tax rates achieve better operational performance, including higher returns on assets and equity, indicating greater stability. Similarly, Wang (2022) reports improvements in net income and financial stability metrics tied to strategic tax management. Complementing these findings, Olarewaju and Olayiwola (2019) and Olamide, Azeez, and Adewale (2019) argue that corporate tax management not only boosts performance but also alleviates financial strain. However, these studies primarily emphasize short-term profitability and operational outcomes without sufficiently addressing the broader concept of financial sustainability. Ma and Park (2021) extend the discussion by suggesting that firms with a strong sustainability orientation tend to adopt tax strategies aligned with long-term financial health, while Bird and Davis-Nozemack (2018) highlight that integrating sustainability principles into tax management reduces reputational risks and the propensity for aggressive tax avoidance.

Although the literature is extensive, several gaps remain. First, many studies are sector-specific or descriptive, focusing on either profitability or short-term performance rather than financial sustainability. Second, while the link between tax management and operational performance is well documented, there is limited research directly connecting tax management to long-term financial sustainability, particularly in high-tech Chinese firms. Third, existing studies rarely examine the mechanisms through which tax management enhances sustainability, such as liquidity management, risk mitigation, and reinvestment for growth. Finally, cross-national comparisons (Dai & Wang, 2019), suggest that China's tax incentives operate differently than in the US or EU, yet few studies critically assess how these differences influence sustainable financial outcomes. This synthesis indicates that, although tax management is widely recognized for improving short-term financial performance (Hanlon & Heitzman, 2010; Liang, Zhang, & Cheng, 2025), its role in ensuring long-term financial sustainability remains underexplored (Ma & Park, 2021) by strategically managing taxes, high-tech enterprises can increase liquidity, mitigate risks, and reinvest in sustainable growth initiatives, thereby maintaining operational continuity and financial resilience (Bird & Davis-Nozemack, 2018). This study addresses this gap by empirically investigating the direct impact of tax management on financial sustainability in Chinese high-tech enterprises (BATH firms) using an ARDL framework (Li, Feng, & Zhang, 2023).

The interest in this group of Chinese high-tech enterprises stems from several factors. First, these enterprises have achieved substantial profit growth, particularly during the Covid-19 period, prompting questions about whether tax management has been one of the key financial pillars underlying this growth. Second, they face increasing international pressure to pay higher taxes, given that they are among the most profitable companies. Third, shareholders and owners are eager to ensure that tax management contributes to the long-term financial sustainability of these enterprises. Fourth, the empirical literature examining the

relationship between tax management and financial sustainability in such enterprises remains scarce. Overall, the literature reveals a fragmented field: tax management is often examined in isolation from sustainability frameworks, while financial sustainability is measured using heterogeneous and sometimes conflicting criteria. What remains underexplored is how responsible tax strategies can simultaneously advance firm-level resilience and contribute to broader goals of long-term financial sustainability in innovation-driven sectors such as China's high-tech industry.

Our study makes several contributions. First, it enriches the literature on the characteristics of tax management in high-tech enterprises and the ongoing debate on its relationship with financial sustainability indicators. Second, when tax management is framed within the objective of achieving financial sustainability, its role evolves from merely minimizing various taxes and fees to prioritizing tax contributions that benefit the communities in which these enterprises operate. Consequently, sustainable financial growth is often accompanied by an increase in the amount of taxes paid. Prior research also indicates that shareholders' concerns about the potential costs and risks associated with tax management have made them reluctant to pursue reductions that could harm the enterprise's reputation, particularly when the financial objective shifts toward sustainability (Gulzar et al., 2018; Speitmann, 2021). Third, we aim to investigate the specific nature of the relationship between tax management and financial sustainability in Chinese high-tech enterprises. This understanding is crucial for researchers, policymakers, and management bodies seeking to position tax management as a supportive factor for long-term sustainability. Finally, this paper is among the first to measure this relationship in both the short and long term using the ARDL model.

In the specific context of high-technology enterprises, such as Baidu, Alibaba, Tencent, and Huawei, tax management practices go beyond the traditional objective of minimizing tax liabilities. These firms operate in highly regulated markets where maintaining legitimacy and government trust is essential. As a result, some high-tech companies deliberately comply with, or even exceed, their tax obligations (Jiang, Hu, & Jiang, 2024; Xu, Wang, Cullinan, & Dong, 2022). While this may appear to reduce immediate financial returns, it can be interpreted as a strategic investment in sustainability accounting and management, strengthening social responsibility, enhancing corporate reputation, and supporting long-term financial sustainability.

In addition to its implications for financial performance, tax management is increasingly recognized as a dimension of sustainability accounting and management (Scarpa & Signori, 2023). Responsible tax strategies not only reflect compliance and efficiency but also signal corporate accountability, fairness in value distribution, and commitment to societal welfare (Jiang et al., 2024). Thus, situating tax management within the broader framework of sustainability accounting provides a more comprehensive understanding of how firms balance financial goals with long-term sustainability responsibilities. Based on this discussion, we propose the following hypothesis:

H_i: Chinese High and New-Technology Enterprises (BATH) practice tax management in both the long and short run.

H_{1,1}: There is a relationship between R&D expenditure and cash effective tax rate.

H_{1,2}: There is a relationship between intangible assets and the cash effective tax rate.

H_{1,3}: There is a relationship between amortization and the cash effective tax rate.

H_{1,4}: There is a relationship between interest expense and cash effective tax rate.

H₂: There is a long-run co-integration relationship between tax management and financial sustainability in high-tech enterprise (BATH).

METHODS

This study uses secondary data collected from publicly accessible company websites and official financial reports of the selected Chinese high-tech enterprises (BATH firms). All data are publicly available and do not contain confidential or personally identifiable information. Accuracy was verified by cross-checking multiple sources to ensure reliability. The research adheres to ethical standards for secondary data use, including transparency, integrity, and responsible reporting. The paper is based on applied research using a quantitative

approach. Enterprise-level data were manually collected from annual reports (in Chinese Yuan) published on the companies' websites as of May 20, 2025.

- Baidu Inc: <https://ir.baidu.com>.
- Alibaba group: <https://www.alibabagroup.com>.
- Tencent : <https://www.tencent.com>.
- Huawei: <https://www.huawei.com>.

In this study, we employed data of 55 observations (years) studied in the statistical model across four high-tech enterprises in China at different periods, as shown in the following: Baidu Inc (2009-2023), Alibaba Group (2013-2023), Huawei (2011-2023), and Tencent (2008-2023). For the methodological framework, this research utilized the well-established Autoregressive Distributed Lag (ARDL) model, developed by Pesaran, Shin, and Smith (2001), to investigate the long-term relationships between the dependent and independent variables (Kripfganz & Schneider, 2023). All econometric estimation and statistical analyses were performed using EViews (version 10) due to its robust capacity for time series analysis and ARDL modeling.

The ARDL model is applied to estimate the relationship between tax management and financial sustainability within Chinese high- and new-technology enterprises. Financial sustainability, used as the dependent variable, is measured through the DuPont ratio pyramid. According to Castro and Chousa (2006), the DuPont ratio pyramid provides an integrated framework for assessing financial sustainability. Originally developed by the DuPont Corporation in the 1920s, the DuPont analysis decomposes Return on Equity (ROE) into three fundamental components: net profit margin, asset turnover, and equity multiplier (Kim, 2016).

The DuPont model is as follows:

ROE = Net Profit Margin * Asset Turnover * Equity Multiplier.

ROE=Net Income/Net revenue*Net revenue/Total average assets*Total average assets/Equity average.

Four variables that proxy the characteristics of tax management are: R&D, intangible assets, interest expense, and amortization.

CETR used by researchers (Graham, Hanlon, Shevlin, & Shroff, 2017). To measure tax management, we are using the Cash ETR proxy as an independent variable, calculated as follows:

CETR (Tax management) = Cash Tax Paid / Income Before Tax.

Finally, the control variable SIZE is defined as the natural logarithm of total assets, which serves as a proxy for firm size.

The following model is constructed:

$$(Ln_CETR) = f(Ln_R\&D, Ln_INTGO, Ln_AMORT, Ln_INTEXP, Ln_DuPont_EQUATION, SIZE) \quad (1)$$

Whereas, Ln CETR; Ln RD; Ln INTGO; Ln AMORT, Ln INTEXP; Ln NPM, Ln AT, and Ln EM are the cash effective tax rate, research and development expense, intangible assets, amortization, net profit margin, assets turnover, and equity multiplier in logarithmic form, respectively.

$$\begin{aligned} (LnCETR_t) = & \alpha_0 + \sum_{i=1}^P b_1 LnCETR_{t-1} + \sum_{i=1}^P b_2 LnRD + \sum_{i=1}^P b_3 LnIntgo + \sum_{i=1}^P b_4 LnAmort + \sum_{i=1}^P b_5 LnInt \exp \\ & + \sum_{i=1}^P b_6 LnNPM + \sum_{i=1}^P b_7 LnAT + \sum_{i=1}^P b_8 LnEM + \sum_{i=1}^P b_9 SIZE + \lambda_1 LnCETR_{t-1} + \lambda_2 LnRD_{t-1} + \lambda_3 LnIntgo_{t-1} \\ & + \lambda_4 LnAmort_{t-1} + \lambda_5 LnInt \exp_{t-1} + \lambda_6 LnNPM_{t-1} + \lambda_7 LnAT_{t-1} + \lambda_8 LnEM_{t-1} + \lambda_9 SIZE_{t-1} + \varepsilon_t \end{aligned} \quad (2)$$

ε_t :Represents the error terms.

RESULTS AND DISCUSSIONS

Table 1 depicts the descriptive statistics of the variables used in the model ARDL. It shows that the highest cash tax rate paid by Tencent, estimated at 43.27 million Chinese yuan in 2023. Also, the lowest tax paid by the same enterprise in 2008 was 0.033 million Chinese yuan. We also note that the average investment in intangible assets was estimated at approximately 63.133 million yuan, and the average investment in R&D expenses was

estimated at approximately 36.54 million yuan. The high amortization expense was achieved by Tencent, estimated at 61.216 million Chinese yuan in 2022. Additionally, the high investment in intangible assets was achieved by Alibaba Group, estimated at 363.604 million Chinese yuan in 2021. We made transformations on the original data by introducing the natural logarithm into the study model to overcome abnormalities in data distribution and make them more suitable for statistical analysis or modeling.

Table :1 Descriptive statistics (Million Chinese yuan)

Observations=55	CETR	RD	INTGO	AMORT	INTEXP	NPM	AT	EM
Mean	8.701	36.545	63.133	13.514	2.726	0.237	0.562	2.010
Maximum	43.270	164.721	363.604	61.216	12.260	0.704	1.194	3.667
Minimum	0.033	0.422	0.0032	0.130	0.000	-0.021	0.277	0.124
Std. Dev.	8.680	43.185	101.196	15.446	2.709	0.147	0.259	0.629

Prior to analyzing the ARDL model's cointegration properties, unit root tests were conducted to establish the variables' order of integration. This verification involved assessing each variable within the dataset using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests (Dickey & Fuller, 1979; Phillips & Perron, 1988). Table 2 presents the results for all variables, estimated under both trend and intercept specifications.

Table 2 : Unit root analysis model

Variables	ADF test (At level)		ADF test (At first difference)	
	Intercept	Intercept and trend	Intercept	Intercept and trend
Ln CETR	-3.624**	-3.629**	-8.826***	-8.737***
Ln RD	-2.147	2.715	-7.403***	-7.403***
Ln INTGO	-3.681***	-3.785**	-6.597***	-6.528***
Ln AMORT	-3.077**	-2.962	-6.703***	-6.685***
Ln INTEXP	-2.783*	-2.747	-7.404***	-7.348***
Ln NPM	-3.512**	-4.122**	-10.166***	-10.053***
Ln AT	-2.049	-2.6005	-6.3404***	-6.273***
Ln EM	-11.845***	-17.443***	-35.620***	-34.802***
SIZE	-2.797*	-2.906	-7.281***	-7.210***
	P–P test (At level)		P–P test (At first difference)	
Variables	Intercept	Intercept and trend	Intercept	Intercept and trend
Ln CETR	-3.619**	-3.630**	-9.680***	-9.569***
Ln RD	-2.206	-2.805	-7.416***	-7.355***
Ln INTGO	-3.302**	-3.378*	-8.009***	-7.866***
Ln AMORT	-3.236**	-3.210	-6.694***	-6.678***
Ln INTEXP	-2.923**	-2.886	-7.423***	-7.364***
Ln NPM	-3.495**	-4.179***	-10.722***	-10.595***
Ln AT	-2.2075	-2.600	-6.281***	-6.203***
Ln EM	-9.054***	-12.056***	-35.620***	-34.802***
SIZE	-2.901**	-3.022*	-7.320***	-7.243***

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Subsequent to the unit root testing, the ARDL methodology was employed to investigate potential long-term relationships among the variables. Before proceeding with the bounds test, the optimal lag length was ascertained to mitigate model misspecification and associated estimation bias. The selection of the lag order relied on the Akaike Information Criterion (AIC), recognized for its efficiency and reliability over alternatives such as the Schwarz Criterion (SC) and Hannan–Quinn Criterion (HQ) (Lütkepohl, 2005; Pesaran et al., 2001). As Table 3 illustrates, a lag length of one (lag 1) proved most appropriate, considering the sample size and the model's inherent structure.

Lag order selection model: ARDL (1, 1, 1, 1, 0, 1, 0, 0, 1).

Table 3: Model Selection Criteria Table

Dependent variable: Ln CETR observations: 54						
Model	LogL	AIC*	BIC	HQ	Adj. R-sq	Specification
23	-2.008	0.629	1.182	0.843	0.951	ARDL(1, 1, 1, 1, 0, 1, 0, 0, 1)
159	-4.219	0.637	1.116	0.822	0.949	ARDL(1, 0, 1, 1, 0, 0, 0, 0, 1)
151	-3.472	0.647	1.162	0.845	0.949	ARDL(1, 0, 1, 1, 0, 1, 0, 0, 1)

Within the developed model, the cointegration test, conducted using the ARDL bounds testing approach (Narayan, 2005) (Table 4), decisively affirms the presence of a long-run equilibrium relationship among the variables. Specifically, the computed F-statistic of 11.735 surpasses all upper critical bound (UCB) values across the 1%, 2.5%, 5%, and 10% significance levels. This robust outcome offers compelling evidence of cointegration between the dependent and independent variables.

Table 4: F-Bounds Test and Diagnostic Tests

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	11.73507	10%	2.38	3.45
k	8	5%	2.69	3.83
		2.5%	2.98	4.16
		1%	3.31	4.63
Tests	Value			
R ²	0.964			
Adj-R ²	0.951			
χ ² NORMAL	0.529			
χ ² SERIAL	0.919			
Heteroskedasticity. T	0.919			

The diagnostic tests (Table 4) provide strong evidence of the model's statistical validity and its conformity with classical regression assumptions (Pei, Zhu, & Li, 2024). The R² value of 0.964, alongside an adjusted R² of 0.951, demonstrates substantial explanatory power, indicating that the independent variables account for the majority of the variation in the dependent variable. Furthermore, the p-values from the normality test (χ² NORMAL = 0.529), the serial correlation test (χ² SERIAL = 0.919), and the heteroskedasticity test (T = 0.919) all exceed conventional significance thresholds. Collectively, these results confirm that the residuals are normally distributed and free from both serial correlation and heteroskedasticity, thereby strengthening confidence in the reliability of the model and the validity of the statistical inferences drawn.

Table 5 ARDL Long Run Form and Bounds Test- Levels Equation in the model

Levels Equation				
Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistics	Prob.
Ln RD	-0.343	0.178	-1.929	0.061
Ln INTGO	0.132	0.051	2.580	0.013
Ln AMORT	0.019	0.064	0.300	0.765
Ln INTEXP	-0.042	0.032	-1.302	0.200
Ln AT	0.874	0.228	3.832	0.000
Ln EM	0.015	0.272	0.057	0.954
Ln NPM	4.499	1.406	3.199	0.003
SIZE	2.581	0.422	6.114	0.000
EC = Ln CETR - (-0.343*Ln RD + 0.132*Ln INTGO + 0.019*Ln AMORT - 0.042*Ln INTEXP + 0.874*Ln AT + 0.015*Ln EM + 4.499*Ln NPM + 2.581*SIZE)				

Focusing on the model presented in Table 5, the observed ARDL long-run results indicate that intangible assets (Ln INTGO), asset turnover (Ln AT), net profit margin (Ln NPM), and firm size (SIZE) have significant positive effects on the cash effective tax rate (Ln CETR), with coefficients of 0.1327, 0.8746, 4.4994, and 2.5807, respectively, all significant at the 1–5% levels. Financially, intangible assets improve firms' ability to generate sustainable profits, increasing taxable income and CETR, consistent with findings on the role of intellectual property and patent location in tax outcomes (Dudar & Voget, 2016). High asset turnover and net profit margins reflect efficient, profitable operations that sustain long-term fiscal contributions, while larger firms benefit from greater financial and managerial capacity, enabling strategic tax management that aligns with accountability and transparency (Chen, Chen, Cheng, & Shevlin, 2010; Lanis & Richardson, 2012). In the case of BATH firms, ownership structures and the significant presence of foreign investors shape corporate tax behavior, as these stakeholders demand greater transparency and compliance. This highlights the role of governance mechanisms in moderating tax strategies and aligning them with sustainable financial practices (Salihu, Annuar, & Obid, 2015). From an economic perspective, asset turnover (Ln AT) serves as a key indicator of a firm's operational efficiency and its ability to generate revenue from existing resources. Higher asset turnover implies that a company is utilizing its assets more effectively, which typically results in increased taxable income and, consequently, a higher cash effective tax rate (CETR) (Higgins, Omer, & Phillips, 2015). Similarly, higher net profit margins and larger firm size indicate profitable operations and greater managerial capacity, which sustain long-term fiscal contributions and enable effective strategic tax management (Lanis & Richardson, 2018). In contrast, research and development expenditures (Ln RD), amortization (Ln AMORT), intangible expenses (Ln INTEXP), and the equity multiplier (Ln EM) are not statistically significant, suggesting limited or no long-term effect on CETR, potentially due to their non-cash nature or indirect influence on taxable profits (Lanis & Richardson, 2018). Overall, these findings highlight that integrating operational efficiency, profitability, and firm size with strategic tax management contributes to sustainable accounting practices, promoting both corporate performance and societal value.

The positive relationship observed in this study can be largely attributed to the significant growth in sales across the BATH firms, with Baidu Inc. (2963.7%), Alibaba Group (2416.5%), Huawei (245.31%), and Tencent (8417.6%) all experiencing substantial increases during the study period. This finding aligns with prior research linking sales growth and profitability to corporate tax behavior. For instance, Sari and Madjid (2025) reported that in Indonesia's pharmaceutical and healthcare manufacturing sectors, higher sales growth and profitability were negatively associated with tax avoidance, suggesting that financially stronger firms are less reliant on aggressive tax strategies. Similarly, Handayani, Ratnasari, and Nursita (2025) examined property and real estate companies and found that sales growth did not significantly influence tax avoidance, highlighting sectoral differences in the tax implications of growth. In contrast, Djatnicka, Wulandari, and Wulandari (2025) showed that in Indonesian manufacturing firms, effective tax management when supported by sales growth enhanced the value-creation potential of operational expansion and dividend policy. Together, these studies reinforce the view that sales growth plays a strategic role in shaping tax management outcomes, though its effects may vary across industries and institutional contexts.

Moreover, sales expansion not only acted as a driver of profitability but also reinforced the alignment of tax strategies with principles of corporate governance and long-term financial sustainability. The rapid increase in revenues exposed BATH firms to closer regulatory and investor scrutiny, particularly from foreign stakeholders, which reduced the scope for aggressive tax avoidance practices (Chen et al., 2010). In addition, higher sales require greater financial disclosure, as listed firms are obliged to provide transparent reporting of tax-related information, thereby increasing accountability (Salihu et al., 2015). At the internal level, sales growth also stimulated the development of stronger governance mechanisms, such as audit committees and compliance systems, which ensured that tax management activities adhered to legal and ethical standards (Anderson & Reeb, 2003). Finally, the reputational considerations associated with large-scale operations encouraged BATH firms to adopt transparent tax strategies, as tax scandals could negatively affect consumer trust and investor confidence (Lanis & Richardson, 2012). Collectively, these factors demonstrate how the sales expansion functioned as both a financial driver and a governance mechanism, fostering more transparent and sustainable tax behavior over time.

The net profit margin (Ln NPM) exhibits a significant positive effect on the cash effective tax rate (CETR) (Coefficient = 4.499, $p = 0.0027$), indicating that increases in profitability lead to higher tax contributions. This finding aligns with previous studies demonstrating a positive association between profitability and tax management. For instance, [Mudjiyanti \(2018\)](#) reported that profitable firms tend to engage more actively in tax management, reflecting stronger tax outcomes. In contrast, [Marques, Rodrigues, and Craig \(2011\)](#) found that Portuguese private firms facing higher income tax rates often reduced reported earnings to minimize tax burdens. Similarly, [Powers, Robinson, and Stomberg \(2016\)](#) showed that firms using after-tax earnings as a basis for executive compensation were more likely to engage in tax management, while [Dwi Rahmawati et al. \(2024\)](#) confirmed that profitability significantly influences tax management in manufacturing firms.

In the context of BATH firms, the positive relationship between net profit margin and CETR underscores the financial strength of high-technology enterprises and their ability to meet fiscal obligations without resorting to aggressive tax avoidance. This alignment between profitability and responsible tax contributions reinforces financial sustainability, ensures stable revenue streams, enhances corporate governance, and maintains stakeholder trust ([Lanis & Richardson, 2018](#); [Salihi et al., 2015](#)). Thus, the net profit margin not only signals operational efficiency but also highlights its role as a cornerstone of sustainable tax management in high-tech enterprises.

Although research and development (R&D) expenditure is theoretically expected to influence corporate tax outcomes, the empirical results of this study reveal that it is not statistically significant in either the short or long run. This insignificance can be attributed to several factors. First, R&D investment is inherently a long-term activity whose benefits, such as innovation outcomes, patents, and productivity gains, tend to materialize over extended periods rather than immediately ([Hall & Van Reenen, 2000](#)). Second, in the Chinese context, generous government policies provide substantial tax incentives and deductions for R&D expenditure, which diminish their observable impact on the effective tax rate ([He, Zhang, Hao, Dai, & Xue, 2025](#); [Jia & Ma, 2017](#); [Li & Du, 2016](#)). Third, for large high-technology enterprises such as BATH firms, R&D is a core strategic activity with relatively stable and predictable spending patterns, leading to limited variation across firms and thereby weakening its explanatory power ([Elschner & Ernst, 2008](#)). Finally, possible multicollinearity between R&D and other variables, particularly intangible assets and firm size, may have further obscured its independent effect ([Cai et al., 2022](#)). Therefore, the lack of statistical significance does not imply that R&D is unimportant, but rather that its effect is indirect, deferred, or embedded within other determinants of financial sustainability ([OECD, 2018](#)).

Despite employing a long-time series dataset and applying the ARDL model, R&D expenditure remained statistically insignificant in both the short- and long-run estimations. This outcome suggests that the benefits of R&D do not translate into immediate or direct effects on the effective tax rate, even when observed over an extended horizon. A plausible explanation is that Chinese high-tech enterprises benefit from substantial tax deductions and government incentives for R&D activities, which reduce the observable impact of R&D on tax outcomes ([Sun, 2022](#)).

Table 6 ARDL Error Correction Regression

Dependent variable: D (Ln CETR)				
Selected model: ARDL (1, 1, 1, 1, 0, 1, 0, 0, 1)				
Case 3: Unrestricted constant and No Trend				
Sample: 1 55				
Included observations: 54				
ECM Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.997	0.357	-11.189	0.000
D(Ln RD)	-0.055	0.153	-0.3621	0.719
D(Ln INTGO)	0.269	0.046	5.812	0.000
D(Ln AMORT)	0.258	0.090	2.855	0.006
D(Ln AT)	0.262	0.288	0.909	0.368

D(SIZE)	1.297	0.409	3.163	0.003
CointEq(-1)*	-0.991	0.088	-11.281	0.000
R-squared	0.955	Mean dependent var		0.037
Adjusted R-squared	0.949	S.D. dependent var		1.196
S.E. of regression	0.269	Akaike Information Criterion		0.333
Sum of squared residuals	3.406	Schwarz criterion		0.591
Log likelihood	-2.008	Hannan-Quinn criterion.		0.433
F-statistic	166.5	Durbin-Watson stat		2.012
Prob(F-statistic)	0.000			

Note: * p-value incompatible with t-Bounds distribution.

The error correction equation for the model can be specified as follows:

$$\Delta \text{LnCETR} = -3.996 - 0.055\Delta \text{LnRD} + 0.268\Delta \text{LnINTGO} + 0.258\Delta \text{LnAMORT} + 0.262\Delta \text{LnAT} + 1.296\Delta \text{SIZE} - 0.991e_{t-1} + \varepsilon_t \quad (3)$$

The estimated ECT value (-0.991) indicates that about 99.11% of past deviations from the long-run equilibrium are corrected within one period, reflecting rapid convergence toward stability. In the short run, the ARDL estimates (Table 6) reveal that intangible assets (Ln INTGO) and amortization (Ln AMORT) exert a significant positive effect on tax management, with a 1% increase in (Ln INTGO) raising CETR by 26.89% and a 1% increase in (Ln AMORT) increasing CETR by 25.80%. These results underscore that, in the immediate term, effective utilization of intangible assets such as software, patents, and proprietary technologies combined with prudent amortization policies enables firms to optimize taxable income and strengthen fiscal outcomes.

However, these effects should be interpreted as temporary adjustments rather than permanent shifts. Intangible investments and amortization schedules primarily influence short-term cash flows and reported earnings, which can ease liquidity constraints and stabilize tax obligations during periods of volatility (Dai & Wang, 2019; Jia & Ma, 2017). By smoothing earnings and aligning tax payments with operational capacity, firms mitigate financial risk and maintain short-term resilience. Moreover, this short-run stability provides a foundation for strategic reinvestment in innovation and growth, as firms can leverage fiscal flexibility to enhance R&D activities and develop long-term innovation capacity (Walter, 2022).

Figures 1A and 1B illustrate the results of the structural stability assessment for the model parameters, conducted using the CUSUM and CUSUM of Squares tests. The results in Part B indicate that the cumulative sum of residuals consistently lies within the critical bounds, thereby confirming the stability of the estimated parameters at the 5% significance level.

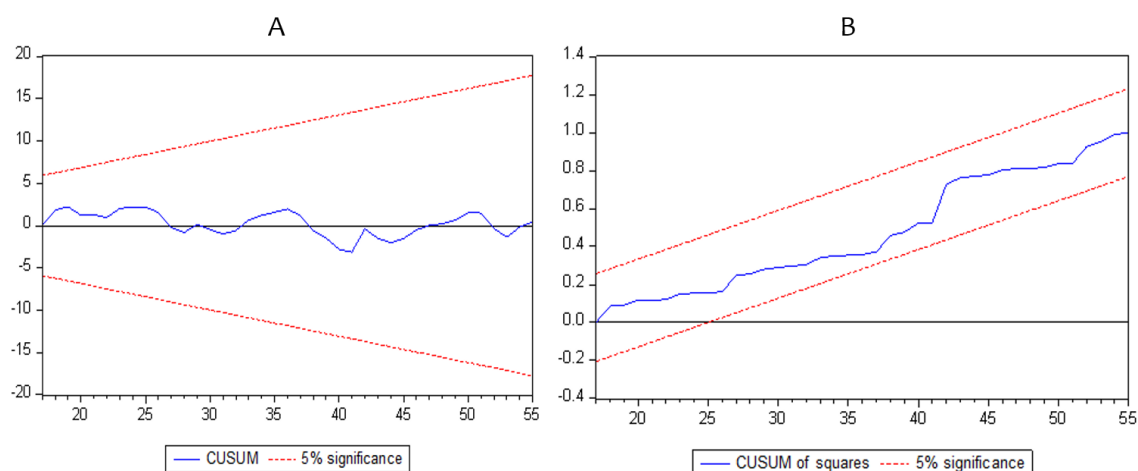


Figure 1: Structural stability test of the model parameters model

CONCLUSION

This study empirically examined the characteristics of tax management and its relationship with financial sustainability in Chinese High and New-Technology Enterprises (HNTEs), focusing on BATH firms. Using annual data and the ARDL approach, the findings confirm long-run cointegration among variables, with net profit margin (NPM), asset turnover (AT), and intangible assets exerting significant positive effects on cash effective tax rate (CETR). In the short run, intangible assets and amortization play a central role.

The positive long-term relationships identified demonstrate that responsible tax management strategies are not only compatible with financial sustainability but also actively reinforce it. Tax practices embedded in R&D, innovation, and intangible assets contribute to corporate resilience, long-term value creation, and sustainable economic growth. By integrating tax management with governance, accountability, and societal considerations, BATH firms enhance broader sustainability outcomes, including financial, social, and economic dimensions. Building on these findings, several practical implications can be drawn for managers and policymakers. First, the findings highlight that tax management should be recognized as a strategic tool for financial sustainability, rather than merely a means of minimizing tax liabilities. Encouraging responsible tax practices can strengthen corporate governance, improve accountability, and guide firms toward more effective resource allocation. Second, tax strategies embedded in R&D, innovation, and intangible assets contribute to long-term corporate resilience and value creation. Policymakers should consider providing incentives and frameworks that encourage firms to integrate such practices into their overall corporate strategy. Third, to align corporate behavior with broader societal goals, the study emphasizes that tax management can play a crucial role in enhancing sustainability outcomes. Responsible tax practices not only support financial performance but also promote societal welfare, economic resilience, and long-term sustainable growth. By incorporating sustainability considerations into policy frameworks, firms can better align tax strategies with environmental, social, and governance (ESG) objectives. The results of this study are consistent with established theoretical perspectives. From the lens of agency theory, the positive relationship between financial sustainability (net profit margin and asset turnover) and tax management supports the idea that well-performing firms adopt responsible tax strategies to reduce agency conflicts, protect reputation, and ensure transparency. Similarly, institutional theory explains the reliance on intangible assets and amortization as tax management tools, reflecting firms' adaptation to the regulatory and incentive structures set by the Chinese government. By engaging in sustainable tax practices, BATH companies align their financial strategies with national innovation policies and broader socio-economic objectives. These findings demonstrate that tax management is not merely a means of tax reduction but a mechanism that reinforces long-term performance, innovation, and legitimacy, thus fully supporting both agency and institutional theoretical frameworks.

Finally, the study suggests that future policy initiatives should encourage transparency, accountability, and innovation in tax management, ensuring that corporate tax practices contribute to both corporate success and broader sustainability goals.

Despite its contributions, this study has several limitations. First, the analysis is limited to BATH firms, which may restrict the generalizability of the results to other high-technology enterprises or different national contexts. Second, the study relies on secondary financial data, which may not fully capture the strategic and behavioral aspects of tax management. Third, the focus is primarily on financial indicators, with limited consideration of broader ESG dimensions.

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REFERENCES

- Anderson, R. C., & Reeb, D. M. (2003). Founding-family ownership and firm performance: evidence from the S&P 500. *The Journal of Finance*, 58(3), 1301-1328. <https://doi.org/10.1111/1540-6261.00567>
- Bird, R., & Davis-Nozemack, K. (2018). Tax avoidance as a sustainability problem. *Journal of Business Ethics*, 151(4), 1009-1025. <https://doi.org/10.1007/s10551-016-3162-2>
- Bowman, W. (2011). Financial capacity and sustainability of ordinary nonprofits. *Nonprofit Management and Leadership*, 22(1), 37-51. <https://doi.org/10.1002/nml.20039>
- Cai, X., Li, J., Wu, J., Zhang, H., Chen, P., & Huang, X. (2022). The impact of enterprise R&D investment and government subsidies on technological progress: Evidence from China's PV industry. *Energies*, 15(12), 4462. <https://doi.org/10.3390/en15124462>
- Castro, N. R., & Chousa, J. P. (2006). An integrated framework for the financial analysis of sustainability. *Business Strategy and the Environment*, 15(5), 322-333. <https://doi.org/10.1002/bse.539>
- Chen, S., Chen, X., Cheng, Q., & Shevlin, T. (2010). Are family firms more tax aggressive than non-family firms? *Journal of Financial Economics*, 95(1), 41-61. <https://doi.org/10.1016/j.jfineco.2009.02.003>
- Dai, X., & Wang, F. (2019). Does the high-and new-technology enterprise program promote innovative performance? Evidence from Chinese firms. *China Economic Review*, 57, 101330. <https://doi.org/10.1016/j.chieco.2019.101330>
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366a), 427-431. <https://doi.org/10.1080/01621459.1979.10482531>
- Djatnicka, E. W., Wulandari, T., & Wulandari, D. S. (2025). The interplay between sales growth and dividend policy in enhancing firm value: The moderating role of tax planning. *International Journal of Accounting, Management, Economics and Social Sciences*, 3(3), 964-973. <https://doi.org/10.61990/ijamesc.v3i3.526>
- Dudar, O., & Voget, J. (2016). Corporate taxation and location of intangible assets: Patents vs. trademarks. ZEW-Centre for European Economic Research Discussion Paper, No. (16-015).
- Dwi Rahmawati, Y., Kholifami, D. A., Safitri, N. L., Wibowo, H. E. S., Pujiyantiningtyas, V., & Amrulloh, A. (2024). Impact of leverage, profitability, and company size on tax planning in manufacturing firms. *Journal Economic Business Innovation*, 1(2), 144-152. <https://doi.org/10.69725/jeb.v1i2.27>
- Elschner, C., & Ernst, C. (2008). *The impact of R&D tax incentives on R&D costs and income tax burden*. ZEW Discussion Papers, No. (08-124).
- Graham, J. R., Hanlon, M., Shevlin, T., & Shroff, N. (2017). Tax rates and corporate decision-making. *The Review of Financial Studies*, 30(9), 3128-3175. <https://doi.org/10.1093/rfs/hhx037>
- Guenther, D. A., Njoroge, K., & Williams, B. M. (2020). Allocation of internal cash flow when firms pay less tax. *The Accounting Review*, 95(5), 185-210. <https://doi.org/10.2308/accr-52623>
- Gulzar, M., Cherian, J., Sial, M. S., Badulescu, A., Thu, P. A., Badulescu, D., & Khuong, N. V. (2018). Does corporate social responsibility influence corporate tax avoidance of Chinese listed companies? *Sustainability*, 10(12), 4549. <https://doi.org/10.3390/su10124549>
- Hakim, I. H., & Omri, M. A. B. (2015). Auditor quality and tax management: evidence from Tunisian companies. *International Journal of Managerial and Financial Accounting*, 7(2), 151-171. <https://doi.org/10.1504/IJMFA.2015.071200>
- Hall, B., & Van Reenen, J. (2000). How effective are fiscal incentives for R&D? A review of the evidence. *Research Policy*, 29(4-5), 449-469. [https://doi.org/10.1016/S0048-7333\(99\)00085-2](https://doi.org/10.1016/S0048-7333(99)00085-2)
- Handayani, P., Ratnasari, F., & Nursita, M. (2025). The influence of sales growth, company size and fixed asset intensity on tax avoidance. *Fokus Ekonomi: Jurnal Ilmiah Ekonomi*, 18(2), 239-245. <https://doi.org/10.34152/fe.18.2.239-245>
- Hanlon, M., & Heitzman, S. (2010). A review of tax research. *Journal of Accounting and Economics*, 50(2-3), 127-178. <https://doi.org/10.1016/j.jacceco.2010.09.002>
- He, Y., Zhang, X., Hao, P., Dai, X., & Xue, H. (2025). Tax incentives and upward R&D manipulation—evidence from the R&D tax deduction policy in China. *International Journal of Emerging Markets*, 20(4), 1507-1529. <https://doi.org/10.1108/IJOEM-02-2022-0254>
- Higgins, D., Omer, T. C., & Phillips, J. D. (2015). The influence of a firm's business strategy on its tax aggressiveness. *Contemporary Accounting Research*, 32(2), 674-702. <https://doi.org/10.1111/1911-3846.12087>
- Jia, J., & Ma, G. (2017). Do R&D tax incentives work? Firm-level evidence from China. *China Economic Review*, 46, 50-66. <https://doi.org/10.1016/j.chieco.2017.08.012>
- Jiang, H., Hu, W., & Jiang, P. (2024). Does ESG performance affect corporate tax avoidance? Evidence from China. *Finance Research Letters*, 61, 105056. <https://doi.org/10.1016/j.frl.2024.105056>

- Kakati, S., & Roy, A. (2021). Financial sustainability: An annotated bibliography. *Economics and Business Review*, 7(3), 35-60. <https://doi.org/10.18559/ebrev.2021.3.4>
- Kim, H.-S. (2016). A study of financial performance using DuPont analysis in food distribution market. *Culinary Science & Hospitality Research*, 22(6), 52-60. <https://doi.org/10.20878/cshr.2016.22.6.005>
- Kripfganz, S., & Schneider, D. C. (2023). ardl: Estimating autoregressive distributed lag and equilibrium correction models. *The Stata Journal*, 23(4), 983-1019. <https://doi.org/10.1177/1536867X231212434>
- Lanis, R., & Richardson, G. (2012). Corporate social responsibility and tax aggressiveness: An empirical analysis. *Journal of Accounting and Public Policy*, 31(1), 86-108. <https://doi.org/10.1016/j.jaccpubpol.2011.10.006>
- Lanis, R., & Richardson, G. (2018). Outside directors, corporate social responsibility performance, and corporate tax aggressiveness: An empirical analysis. *Journal of Accounting, Auditing & Finance*, 33(2), 228-251. <https://doi.org/10.1177/0148558X16654834>
- Li, N., Feng, J., & Zhang, C. (2023). Macro tax incentives and corporate sustainable innovation: Evidence from Chinese Enterprises. *Environmental Science and Pollution Research*, 30(45), 101546-101564. <https://doi.org/10.1007/s11356-023-29268-0>
- Li, W., & Du, J. (2016). Tax incentives, adjustment costs, and R&D investment in China. *China Journal of Accounting Studies*, 4(4), 433-455. <https://doi.org/10.1080/21697213.2016.1252088>
- Liang, Y., Zhang, J., & Cheng, C. (2025). Tax planning and sustainable growth: The mediating role of R&D investment in China. In M. Huang, V. B. Gaikar, M. R. Islam, & I. K. Todorov (Eds). Paper presented at the Proceedings of the 2024 6th Management Science Informatization and Economic Innovation Development Conference (MSIEID 2024), Atlantis Press International BV.
- Lütkepohl, H. (2005). *New introduction to multiple time series analysis*. Berlin Heidelberg: Springer.
- Ma, H. Y., & Park, S. J. (2021). Relationship between corporate sustainability management and sustainable tax strategies. *Sustainability*, 13(13), 7429. <https://doi.org/10.3390/su13137429>
- Marques, M., Rodrigues, L. L., & Craig, R. (2011). Earnings management induced by tax planning: The case of Portuguese private firms. *Journal of International Accounting, Auditing and Taxation*, 20(2), 83-96. <https://doi.org/10.1016/j.intaccudtax.2011.06.003>
- Mudjiyanti, R. (2018). *The effect of tax planning, ownership structure, and deferred tax expense on earning management*. Paper presented at the Proceedings of the 5th International Conference on Community Development (AMCA 2018). 2018 3rd International Conference on Education, Sports, Arts and Management Engineering (ICESAME 2018), Quezon City, Philippines.
- Narayan, P. K. (2005). The saving and investment nexus for China: evidence from cointegration tests. *Applied Economics*, 37(17), 1979-1990. <https://doi.org/10.1080/00036840500278103>
- OECD. (2018). *OECD science, technology and innovation outlook 2018: Adapting to technological and societal disruption*. Paris, France: OECD Publishing.
- Olamide, F., Azeez, O., & Adewale, O. (2019). The corporate tax planning and financial performance of systemically important banks in Nigeria. *Ekonomski Horizonti*, 21(1), 15-28.
- Olarewaju, O. M., & Olayiwola, J. A. (2019). Corporate tax planning and financial performance in Nigerian non-financial quoted companies. *African Development Review*, 31(2), 202-215.
- Osazefua Imhanzenobe, J. (2020). Managers' financial practices and financial sustainability of Nigerian manufacturing companies: Which ratios matter most? *Cogent Economics & Finance*, 8(1), 1724241. <https://doi.org/10.1080/23322039.2020.1724241>
- Pei, J., Zhu, F., & Li, Q. (2024). Diagnostic checks in time series models based on a new correlation coefficient of residuals. *Journal of Applied Statistics*, 51(12), 2402-2419. <https://doi.org/10.1080/02664763.2023.2297155>
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326. <https://doi.org/10.1002/jae.616>
- Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335-346. <https://doi.org/10.1093/biomet/75.2.335>
- Powers, K., Robinson, J. R., & Stomberg, B. (2016). How do CEO incentives affect corporate tax planning and financial reporting of income taxes? *Review of Accounting Studies*, 21(2), 672-710. <https://doi.org/10.1007/s11142-016-9350-6>
- Putra, I., Wiagustini, N. L. P., Ramantha, I. W., & Sedana, I. B. P. (2022). Intellectual capital and financial sustainability. *International Journal of Accounting & Finance in Asia Pacific*, 5(2), 12-26. <https://doi.org/10.32535/ijafap.v5i2.1590>
- Salihu, I. A., Annur, H. A., & Obid, S. N. S. (2015). Foreign investors' interests and corporate tax avoidance: Evidence from an emerging economy. *Journal of Contemporary Accounting & Economics*, 11(2), 138-147. <https://doi.org/10.1016/j.jcae.2015.03.001>

- Sari, I. R., & Madjid, S. (2025). Impact of sales growth, corporate risk, profitability, and liquidity on tax avoidance strategies. *Taxation and Public Finance*, 2(2), 105-116. <https://doi.org/10.58777/tpf.v2i2.366>
- Scarpa, F., & Signori, S. (2023). Understanding corporate tax responsibility: A systematic literature review. *Sustainability Accounting, Management and Policy Journal*, 14(7), 179-201. <https://doi.org/10.1108/SAMPJ-04-2022-0200>
- Shevlin, T. (2020). An overview of academic tax accounting research drawing on US multinational taxation. *Journal of International Accounting Research*, 19(3), 9-17. <https://doi.org/10.2308/JIAR-2020-065>
- Speitmann, R. (2021). *Reputational risk and corporate tax planning*. WU International Taxation Research Paper Series, No. (2021-11).
- Sun, Y. (2022). Tax incentives, tax enforcement, and enterprise R&D investment: Evidence from Chinese A-share listed. *Frontiers in Psychology*, 13, 953313. <https://doi.org/10.3389/fpsyg.2022.953313>
- Tackie, G., Agyei, S. K., Bawuah, I., Adela, V., & Bossman, A. (2022). Tax planning and financial performance of insurance companies in Ghana: The moderating role of corporate governance. *Cogent Business & Management*, 9(1), 2144097. <https://doi.org/10.1080/23311975.2022.2144097>
- Tian, B., Yu, B., Chen, S., & Ye, J. (2020). Tax incentive, R&D investment and firm innovation: Evidence from China. *Journal of Asian Economics*, 71, 101245. <https://doi.org/10.1016/j.asieco.2020.101245>
- Ur Rahman, R., Ali Shah, S. M., El-Gohary, H., Abbas, M., Haider Khalil, S., Al Altheeb, S., & Sultan, F. (2020). Social media adoption and financial sustainability: Learned lessons from developing countries. *Sustainability*, 12(24), 10616. <https://doi.org/10.3390/su122410616>
- Walter, N. (2022). The bright side, or on prosocial engagement of children and youth, both off- and on-line. In M. Sajkowska & R. Szredzińska (Eds.), *Children Count 2022: Report on risks to children's safety and development in Poland*. In (pp. 376–391). Warsaw, Poland: Empowering Children Foundation
- Wang, Q. (2022). Income tax planning as a tool for achieving financial stability. *Engineering Economics*, 33(5), 496-506. <https://doi.org/10.5755/j01.ee.33.5.29785>
- Xu, S., Wang, F., Cullinan, C. P., & Dong, N. (2022). Corporate tax avoidance and corporate social responsibility disclosure readability: Evidence from China. *Australian Accounting Review*, 32(2), 267-289. <https://doi.org/10.1111/auar.12372>
- Zhang, Q. (2019). High-Tech enterprise tax planning. *American Journal of Industrial and Business Management*, 9(1), 191-203. <https://doi.org/10.4236/ajibm.2019.91013>