Applied Economics Letters

ISSN: 1350-4851 (Print) 1466-4291 (Online) Journal homepage: www.tandfonline.com/journals/rael20

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Yongjian Lin & Zhicheng Song

To cite this article: Yongjian Lin & Zhicheng Song (10 Mar 2025): Biodiversity risks and corporate tax avoidance, Applied Economics Letters, DOI: 10.1080/13504851.2025.2477309

To link to this article: https://doi.org/10.1080/13504851.2025.2477309

APPLIED ECONOMICS LETTERS
https://doi.org/10.1080/13504851.2025.2477309

Routledge
Taylor & Francis Group

Biodiversity risks and corporate tax avoidance

Yongjian Lin and Zhicheng Song

School of Economics and Management, Xiamen University of Technology, Xiamen, China

ABSTRACT

In the context of global sustainable development, the issue of how biodiversity risk affects the financial decision-making behaviour of enterprises is an ongoing concern. This study examines the relationship between biodiversity risk exposure and corporate tax management. Using a measure of biodiversity risk based on textual analysis, we find that biodiversity risk is positively associated with the level of tax avoidance. Further, we find that exacerbating operating risk and financing constraints are critical channels through which biodiversity risk affects corporate tax avoidance. Additionally, the relationship between biodiversity risk exposure and corporate tax avoidance is more pronounced among firms with poorer reputations, not holding bank shares and lower CEO power. Overall, biodiversity risk creates new challenges for business operations while affecting government revenues.

KEYWORDS

Biodiversity risks; tax avoidance; financing constraints; operating risk

JEL CLASSIFICATION

Q50; H26

I. Introduction

The planet's biodiversity is facing an unprecedented crisis stemming from the impact of human activities. Based on the Global Assessment Report on Biodiversity and Ecosystem Services issued by the United Nations, 1 million of the world's 8 million species are currently under threat of extinction as a result of human activities. The loss of biodiversity not only affects the ecosystems on which human beings depend for their survival, but also poses a major challenge to economic development. According to statistics, biodiversity degradation can cost up to 20 trillion dollars annually (Ahmad and Karpuz 2024). In terms of micro effects, biodiversity risks severely threaten the sustainability of individual businesses. This adverse influence is reflected in capital market performance, operational efficiency, and external financing (Ma, Wu, and Zeng 2024). Consequently, exploring the economic consequences of biodiversity risk is of great theoretical and practical significance. Even though there is a certain amount of research on biodiversity risk in the existing literature, the discussion on the management strategies of enterprises under biodiversity risk is quite limited. With this in mind, this paper explores how biodiversity risk exposure affects corporate tax management strategies.

Taxes are an integral component of government revenues and one of the main operating costs burdened by enterprises. Through tax avoidance, firms can convert profits that are supposed to be distributed to the government into retained earnings, guaranteeing business sustainability (Hasan et al. 2024). Nevertheless, overly aggressive tax avoidance can jeopardize corporate reputation and exacerbate the risk of corporate illegality (Chun et al. 2020). Existing studies argue that corporate social responsibility facilitates obtaining the trust of stakeholders such as banks, investors, and upstream and downstream firms in the supply chain, and reduces the likelihood of precautionary cash reserves through tax avoidance (Yoon, Lee, and Cho 2021). Meanwhile, Laguir, Staglianò, and Elbaz (2015) found that firms' active participation in environmental protection suppresses tax avoidance incentives by enhancing corporate ethical awareness. However, geopolitical risks and air pollution induce firms to engage in aggressive tax avoidance by increasing the cost of capital, increasing the volatility of cash flows, and reducing profitability (Haque, Pham, and Yang 2023; Shen et al. 2022). Thus, biodiversity risk, as a manifestation of

CONTACT Zhicheng Song songzc0108@163.com School of Economics and Management, Xiamen University of Technology, No. 600 Ligong Road, Xiamen, China

Supplemental data for this article can be accessed online at https://doi.org/10.1080/13504851.2025.2477309

the absence of corporate social responsibility, may affect corporate tax avoidance.

As one of the countries with the richest biological resources, China's rapid economic growth in recent years has caused tremendous pressure on the natural ecosystem. Meanwhile, China's current regulatory system still has flaws, and many enterprises are engaged in tax avoidance. This background provides ideal conditions for the study. Based on this, we test the relationship between biodiversity risk exposure and corporate tax avoidance using an ordinary least squares regression model with a sample of Chinese A-share listed companies from 2007 to 2022. We find that biodiversity risk exacerbates corporate tax avoidance by increasing business risk and financing constraints. In addition, the relationship is particularly pronounced for firms with lower reputations, not holding bank shares and lower CEO power.

The contribution of this paper is twofold. First, while recent studies have investigated the impact of biodiversity risk on capital markets (Ma, Wu, and Zeng 2024), they have lacked an exploration of the impact on corporate tax management strategies. This paper finds that biodiversity risk reduces corporate tax compliance. This contributes to the government's recognition of the potential costs associated with facilitating the green transition of corporations. Second, this paper provides a new perspective on the factors influencing corporate tax management. We support Ni et al. (2022) and Song and Xian (2025), finding that firms may increase tax avoidance when they are exposed to natural environmental risks.

II. Hypothesis development

First, stakeholder theory indicates that corporate sustainability cannot be achieved without the support of stakeholders, and that corporate biodiversity destruction may jeopardize the harmonious relationship between enterprises and stakeholders (Garel et al. 2024). Thus, firms exposed to biodiversity risks commonly face compliance risks such as fines, lawsuits, and market exclusion (Bassen et al. 2024). Additionally, biodiversity risks can disrupt companies' supply chains and increase resource acquisition costs (Bach, Hoang, and Le 2024). These influential factors will result in enhanced operational uncertainty. To ensure operational stability, firms have a strong incentive to improve cash flow through greater tax avoidance (Shen et al. 2022). Second, as the principle for responsible investment gradually becomes a social consensus, firms with biodiversity risks may suffer from investor divestment or capital flow restrictions, thus raising difficulties in external financing (Garel et al. 2024). According to the pecking order theory, firms tend to prioritize endogenous financing when seeking financing (Myers 1984). Therefore, when the cost of acquiring external resources increases, firms are more likely to raise endogenous finance through tax avoidance. Thus, we propose the following hypothesis: Biodiversity risk exacerbates corporate tax avoidance.

III. Sample and data

We adopt the text-based approach of F. He, Chen, and Lucey (2024) for firm-specific biodiversity risk measurement. See Appendix IV for detailed definitions.

We use the difference between accounting income and taxable income to measure the degree of tax avoidance (BTD), specifically the ratio of the difference between total profit and taxable income to the total assets.

The data mainly comes from the China Stock Market & Accounting Research database and the Chinese Research Data Services Platform. Considering the new accounting standards issued by the Chinese government in 2006, resulting in significant changes in the standards and quality of corporate disclosure, this paper selects Chinese A-share listed companies from 2007 to 2022 as the research sample. Then the following principles are adopted to screen the sample: (1) excluding financial listed companies; (2) excluding listed companies that are missing in the main variables; (3) excluding ST and PT companies; and (4) winsorizing at the 1st and

99th percentiles for continuous variables. The final result was 29,450 samples. We use the following model to test our hypotheses:

$$TA_{i,t} = \beta_0 + \beta_1 BR_{i,t} + \beta_2 Controls_{i,t} + YEAR + FIRM + INDUSTRY + \varepsilon_{i,t} \quad (1)$$

Where i denotes the firm and t denotes the year. *BR* is a dummy variable for whether the firm is exposed to biodiversity risk, *TA* denotes the level of corporate tax avoidance, and *Control* is the control variables chosen concerning Hasan et al. (2024) and G. He and Shen (2024). *YEAR*, *FIRM*, and *INDUSTRY* denote the year, individual, and industry fixed effects. Standard errors are clustered at the firm level. Appendix I provides detailed definitions and descriptive statistics for the main variables.

IV. Results

Baseline results

We run regressions based on Equation 1 for the full sample. As shown in Table 1, the coefficient of *BR* is significantly positive in both regressions, supporting hypothesis H1. Analysed in terms of economic significance, if BR increases by 1 unit of standard deviation (0.494), the average increase in corporate tax avoidance is equivalent to 2.28% of the sample standard deviation ($0.0012 \times 0.494/0.026$). In addition, we conducted a variance

Table 1. Biodiversity risks and corporate tax avoidance.

	(1)	(2)
Variable	TA	TA
BR	0.0013***	0.0012***
	(0.0004)	(0.0004)
SIZE		−0.0010**
		(0.0005)
LEV		0.0004***
		(0.0001)
ROA		0.2418***
		(0.0084)
GROWTH		−0.0038***
		(0.0004)
INDEP		−0.0000
		(0.0001)
BOARD		−0.0029*
		(0.0017)
MSHARE		−0.0001***
		(0.0000)
TOP1		−0.0000
		(0.0000)
DUAL		−0.0018***
		(0.0006)
INST		−0.0010
		(0.0019)
RD		0.0571**
		(0.0224)
INV		−0.0046
		(0.0031)
FIXED		0.0064***
		(0.0025)
FIRMAGE		0.0046
		(0.0030)
BIG4		0.0010
		(0.0014)
SOE		−0.0002
		(0.0012)
CASH		−0.0093***
		(0.0023)
TOBINQ		0.0002
		(0.0002)
Constant	0.0016***	0.0066
	(0.0002)	(0.0155)
Year/Firm/Industry FE	Yes	Yes
Observations	29450	29450
Adj-R2	0.3434	0.4318

*, **, and *** denote significant at 10%, 5%, and 1% levels, respectively.

inflation factor test and found that the average VIF value was 1.55 and that the VIF values for all variables were less than 3.

Robustness checks

We also conducted endogeneity tests and other robustness tests (see Appendix II), such as the differences-in-differences method, instrumental variables, propensity score matching, Heckman two-stage regression, coefficient stability tests, and replacement variable measures, all of which indicate that the conclusions are valid.

Potential mechanism analysis

In this section, we explore whether increased business risk and financing constraints are mechanisms that biodiversity risk causes corporate tax avoidance. We construct the following

Table 2. Mechanism tests.

	(1)	(2)	(3)	(4)
VARIABLES	OR	TA	WW	TA
BR	0.0137**	−0.0004	0.0017***	0.0166***
	(0.0061)	(0.0007)	(0.0005)	(0.0056)
BR×OC		0.0040***		
		(0.0014)		
BC		0.0004		
		(0.0010)		
BR×WW				0.0151***
				(0.0054)
WW				0.0165**
				(0.0067)
SIZE	0.0129	−0.0021***	−0.0486***	0.0002
	(0.0083)	(0.0006)	(0.0006)	(0.0006)
LEV	0.0035*	0.0003*	−0.0006***	0.0004***
	(0.0019)	(0.0002)	(0.0001)	(0.0001)
ROA	0.3958***	0.2590***	−0.1299***	0.2488***
	(0.0754)	(0.0102)	(0.0074)	(0.0090)
GROWTH	−0.0232***	−0.0037***	−0.0405***	−0.0028***
	(0.0054)	(0.0005)	(0.0009)	(0.0005)
INDEP	0.0008	0.0000	0.0001	−0.0000
	(0.0008)	(0.0001)	(0.0001)	(0.0001)
BOARD	0.0411	−0.0018	0.0029	−0.0028
	(0.0283)	(0.0020)	(0.0022)	(0.0018)
MSHARE	−0.0025***	−0.0002***	−0.0001***	−0.0001***
	(0.0005)	(0.0000)	(0.0000)	(0.0000)
TOP1	0.0016***	−0.0000	−0.0001**	−0.0000
	(0.0005)	(0.0000)	(0.0000)	(0.0000)
DUAL	−0.0068	−0.0020***	0.0001	−0.0018***
	(0.0085)	(0.0007)	(0.0007)	(0.0006)
INST	0.1093***	−0.0004	−0.0091***	−0.0006
	(0.0268)	(0.0022)	(0.0021)	(0.0019)
RD	−0.0969	0.0466*	−0.0868***	0.0542**
	(0.3031)	(0.0267)	(0.0240)	(0.0234)
INV	−0.1256***	−0.0048	0.0067*	−0.0056*
	(0.0452)	(0.0034)	(0.0039)	(0.0033)
FIXED	−0.0693*	0.0049*	−0.0126***	0.0063**
	(0.0362)	(0.0029)	(0.0031)	(0.0026)
FIRMAGE	0.1229**	0.0043	0.0020	0.0022
	(0.0544)	(0.0039)	(0.0035)	(0.0031)
BIG4	0.0154	0.0021	−0.0007	0.0012
	(0.0226)	(0.0016)	(0.0017)	(0.0015)
SOE	−0.0238	0.0000	−0.0017	−0.0007
	(0.0170)	(0.0014)	(0.0016)	(0.0013)
CASH	0.0022	−0.0085***	−0.0241***	−0.0090***
	(0.0351)	(0.0030)	(0.0027)	(0.0025)
TOBINQ	−0.0040	−0.0003	0.0013***	0.0001
	(0.0029)	(0.0003)	(0.0003)	(0.0003)
Constant	−0.3732	0.0279	0.0793***	0.0015
	(0.2452)	(0.0195)	(0.0175)	(0.0163)
Year/Firm/Industry FE	Yes	Yes	Yes	Yes
Observations	21978	21978	25347	25347
Adj-R2	0.3733	0.4423	0.8768	0.4259

*, **, and *** denote significant at 10%, 5%, and 1% levels, respectively.

model to verify the above mechanisms. Where $M_{i,t}$ are the mechanism variables and the rest is consistent with the model (1).

$$M_{i,t} = \beta_0 + \beta_1 BR_{i,t} + \beta_2 Controls_{i,t} + YEAR + FIRM + INDUSTRY + \varepsilon_{i,t} \quad (2)$$

$$TA_{i,t} = \beta_0 + \beta_1 BR \times M_{i,t} + \beta_2 BR_{i,t} + \beta_3 M_{i,t} + \beta_4 Controls_{i,t} + YEAR + FIRM + INDUSTRY + \varepsilon_{i,t} \quad (3)$$

We calculate the cumulative distribution probability of the standard deviation of earnings before interest, tax, depreciation, and amortization (EBITDA) and use it to measure firms' operational risk (OR). Then we measure the degree of firms' financing constraints by the WW index. See Appendix IV for the construction of the indicator. The results are shown in Table 2. As shown in Table 2, biodiversity risk increases corporate tax avoidance by exacerbating business risks and financing constraints.

Heterogeneity analysis

To understand whether the effect of biodiversity risk on corporate tax avoidance differs across firms with different governance and operating conditions, we conducted a heterogeneity analysis. As shown in Appendix III, we find that the effect is more pronounced among firms with poorer reputations, no bank shareholdings and lower CEO power.

V. Conclusion

This paper finds that biodiversity risk increases corporate tax avoidance by exacerbating financing constraints and operating risks. The relationship is more pronounced among firms with poorer reputations, not holding bank shares and lower CEO power. We enrich the theoretical findings on the relationship between social responsibility and corporate tax avoidance and support the theoretical framework of Ni et al. (2022). In addition, in the context of global green transition, we provide implications for governments to detect and respond to corporate opportunistic behaviour in tax administration. We propose the following practical recommendations. First, the government should provide tax incentives and green loans to enterprises in green transformation, thereby improving their sustainable development capacity. Second, tax administrations should focus particularly on biodiversity risk enterprises and their internal characteristics. Finally, enterprises should systematically assess their biodiversity risks and enhance communication with stakeholders to strengthen the risk-taking ability. However, the conclusions are limited to listed companies in China, while the legal and institutional environments of developed countries are quite different from China, and the conclusions may not be applicable to developed countries. Meanwhile, different enterprises are affected by biodiversity risk to different degrees, but the biodiversity risk indicators in this paper cannot accurately reflect such differences.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The work was supported by the Fujian Province Social Science Fund of China [FJ2024B037]; Xiamen University of technology "Research Climbing" Program [XPDST19001].

Author contributions

CRediT: **Yongjian Lin:** Data curation, Formal analysis, Funding acquisition, Software; **Zhicheng Song:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation.

ORCID

Zhicheng Song http://orcid.org/0009-0002-6963-6835

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